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AN ECONOMIC AND STATISTICAL ANALYSIS OF HIGHWAY-CONSTRUCTION EXPENDITURES

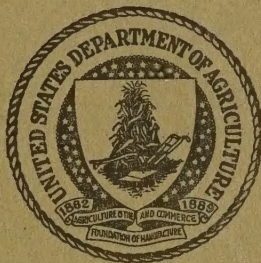
By
THE BUREAU OF PUBLIC ROADS

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UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

AN ECONOMIC AND STATISTICAL ANALYSIS OF HIGHWAY-CONSTRUCTION EXPENDITURES

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HIGHWAY CONSTRUCTION AS AN EMPLOYMENT MEASURE DURING DEPRESSION

The individual activities that are comprised in our complete economic set-up are many and varied (fig. 1).¹ The forms of business and social organization are so numerous and so subject to growth and change that an occasional set-back of orderly economic progress should cause neither surprise nor bewilderment. Man's activities are mutually interdependent and when all are functioning normally they constitute a balanced economic life. When some of these activities function abnormally, progress becomes unbalanced, the course of our economic life is disturbed, and many social and economic ills ensue.

THE CONSTRUCTION INDUSTRY AND THE DEPRESSION

The importance of the construction industry is shown by table 1.³ The subnormal amount of construction activity has been coincident with and contributory to the depression. Figure 2⁴ shows the trend of construction activity through 1933 and clearly depicts its rise up to 1928 and subsequent collapse through 1933. Such abnormal functioning of construction activity entailed serious disturbance in other related activities and is clearly accountable as one of the major forces of depression.

¹ The basis for the preparation of fig. 1 is the Fifteenth Census of the United States, 1930, Unemployment (22).² Numbers of gainful workers have been determined for the years 1925-33 by deducting current unemployment from gainful worker groups as reported by the Bureau of the Census. Data on unemployment for the years 1925-33 were obtained by means of indices of Bureau of Labor Statistics (53) composed with estimates of unemployment of the American Federation of Labor (4) and the National Industrial Conference Board (12).

² Italic numbers in parentheses refer to bibliography, p. 55.

³ Average of estimates compiled by the Federal Employment Stabilization Board based on reports to the F. W. Dodge Corporation, the Department of Agriculture, the Bureau of the Census, and the Stabilization Board.

⁴ Based on data of tables 1 and 21, fig. 1, and the Census of Construction (23). Normally, the total population of 122,000,000 persons is supported by about 47,000,000 gainful workers. Some 13,000,000 of the latter are normally engaged in construction activity and the manufacture of related producer goods. The remaining 34,000,000 gainful workers are in the consumer field engaged in the production and distribution of goods consumed by themselves, the 13,000,000 persons employed in the field of producer goods and the 75,000,000 dependent persons. Unemployment curtails average consumption and increases relative dependency. Thus, the collapse of the construction industry, which put 7,000,000 persons out of work in the producer-goods field, further caused the unemployment of 4,000,000 more in the consumer-goods field.

Public works, comprising nearly one-third of the total construction in the United States (fig. 3),⁵ at times are carried on to supplement the reduced volume of total business activity. The improvement

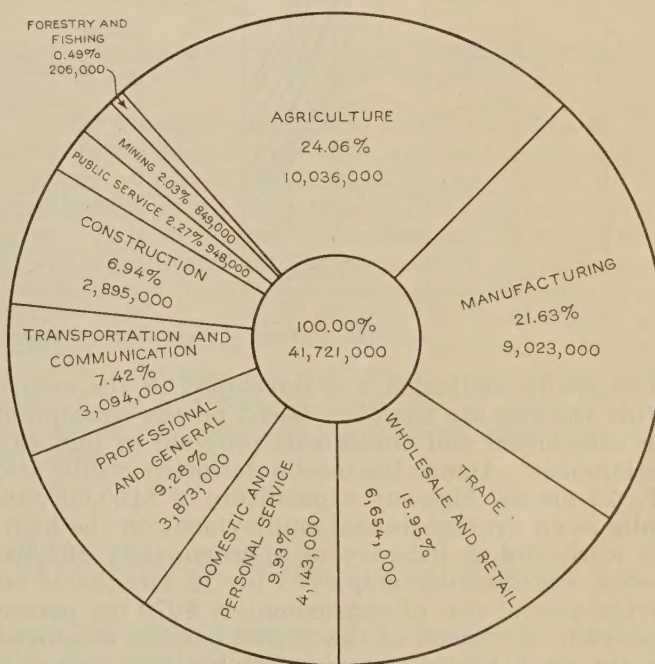


FIGURE 1.—Estimated percentage and average (1925-33) number of persons employed in the United States, distributed by groups, based on average unemployment estimates.

of highways has become one of the most important integral parts of public works. In a period of depression, highway construction looms large as a factor in the stabilization of industry and the reemployment of

⁵ From data of table 1.

labor. However, definite valuation of highway construction as a relief measure, or as an aid in the establishment of orderly economic life, is impossible in the absence of specific and accurate information, showing not only the direct or local effect of highway construction but also the indirect or auxiliary industrial effect.

THE EFFECT OF HIGHWAY CONSTRUCTION

The purpose of this report is to set forth, in considerable detail, the influence exerted by an average annual Federal and State highway program upon our economic life, assuming the work analyzed to be unaffected by abnormal years preceding or following. It is intended to present the effects of a continuing program of highway construction and such allied data as may be useful to public officials in determining highway policy.

38 hours of work per week at 59 cents per hour. The average annual wage is \$640 for job labor and \$1,170 for industrial labor.

4. Highway-construction employment is furnished in rural areas and in urban areas in the same general proportions in which unemployment exists in these areas.

5. A variety of highway types, on which the relative amounts of direct and indirect labor vary, contribute to the feasibility of adapting employment in rural and urban areas in proportion to unemployment in those areas.

6. An annual highway expenditure of \$100,000,000 initiates a movement which eventually involves, in the handling and processing of materials by industry, a total value of business transacted of approximately \$315,000,000.

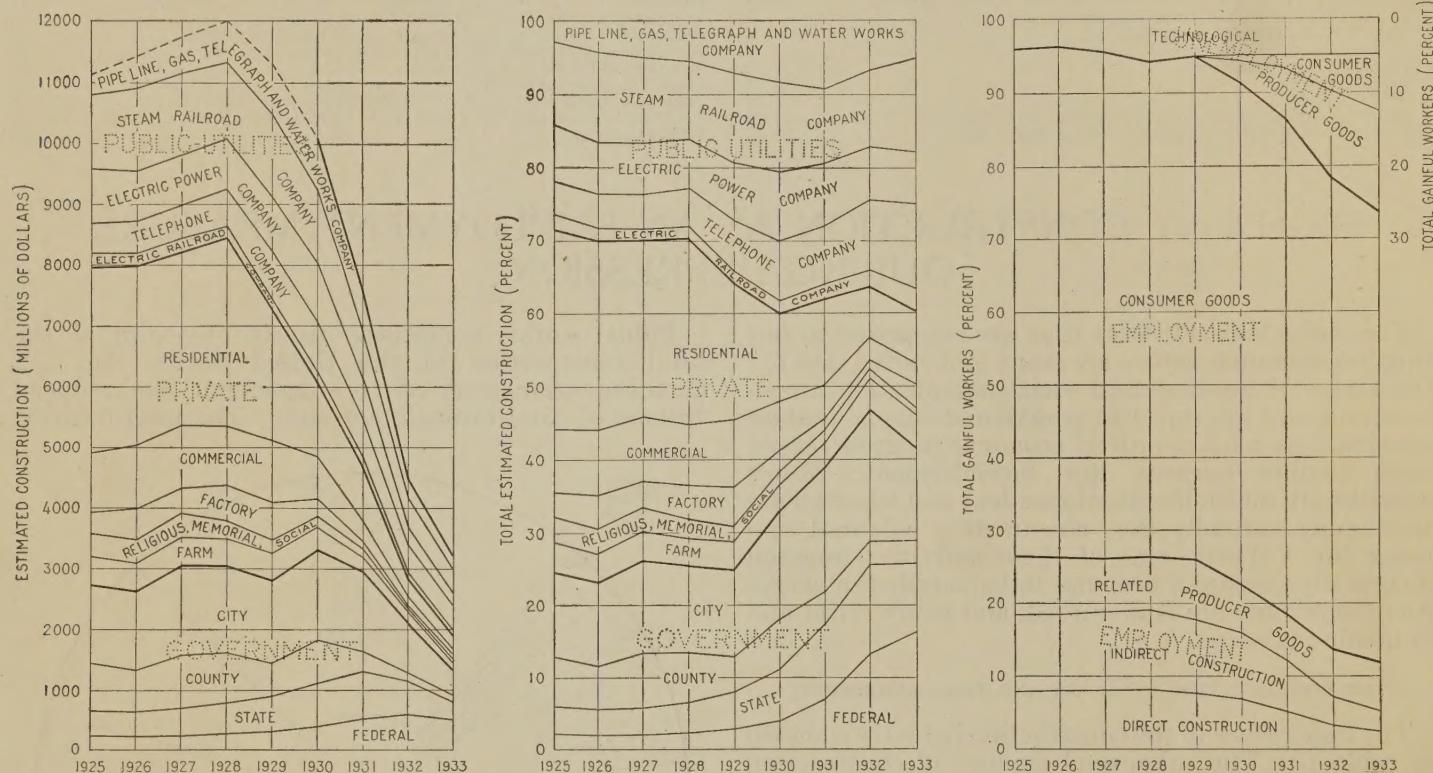


FIGURE 2.—Trend of construction and related employment data in the United States, 1925 to 1933.

The results indicated and developed in the course of this analysis are therefore based on the conception of a substantial and continuous program of highway development. Among the most noteworthy results are:

1. An annual highway expenditure of \$100,000,000 results in an average annual employment on the highway work and in industry of approximately 102,690 persons, continuously employed for 12 months at an average annual cost of approximately \$970 per person employed. For each of the 37,960 persons employed directly on highway construction projects, approximately 1.71 names of individuals appear on project pay rolls.

2. For each person employed directly on highway jobs, approximately 1.7 persons are employed indirectly in industries furnishing materials, equipment, supplies, and services.

3. The average direct worker continuously employed actually obtains 25.8 hours of work per week at 48 cents per hour. The average indirect worker obtains

7. In addition to affording economic and unemployment relief, highway construction eventually provides a connected highway system which is a distinct national asset, promoting agricultural and industrial expansion and fostering social values.

Highway expenditures are providing a connected highway system composed of various road types and containing a variety of materials. The raw materials used in highway construction have wide-spread occurrence in nature. The adaptation of these natural resources to highway use requires numerous stages of processing. Stone must be quarried, transported, crushed, separated into sizes and proportioned with other materials in proper amount. Clay must be dug and converted into brick and tile. Limestone and gypsum must be quarried and manufactured into cement and plaster. Petroleum must be produced and refined into fuels and asphalts. Iron ore must be mined and shipped, and blast furnaces and steel mills must operate to produce structural and reinforcing

TABLE 1.—*Estimated average annual construction expenditure in the United States, 1926 to 1933*

Class of construction	Public highway		Other		Total	
		Pct.		Pct.		Pct.
Federal.....	\$135,816,000	1.53	\$242,309,000	2.73	\$378,125,000	4.26
State.....	428,922,000	4.82	103,953,000	1.17	532,875,000	5.99
County.....	327,128,000	3.68	200,497,000	2.25	527,625,000	5.93
City.....	457,311,000	5.14	735,064,000	8.26	1,192,375,000	13.40
Total, Government.....	1,349,177,000	15.17	1,281,823,000	14.41	2,631,000,000	29.58
Residential.....					1,712,250,000	19.25
Commercial.....					665,625,000	7.48
Factory.....					334,125,000	3.76
Farm.....					352,625,000	3.97
Religious, memorial, and social.....					213,875,000	2.40
Total, private.....					3,278,500,000	36.86
Steam railroad.....					1,031,875,000	11.60
Electric power company.....					694,375,000	7.81
Telephone company.....					588,125,000	6.61
Pipe line company.....					1,309,750,000	3.48
Electric railroad company.....					167,750,000	1.89
Gas company.....					133,750,000	1.50
Telegraph company.....					136,750,000	.41
Waterworks company.....					123,000,000	.26
Total, public utilities.....					2,985,375,000	33.56
Grand total.....					8,894,875,000	100.00

¹ Averages are based on data for years 1930-33.

steel. Cotton must be grown, ginned, and woven into fabric for tires and containers. Coal must be mined, and timber felled and milled. Finally, these materials must be concentrated in various proportions at numerous sites of construction and, after the application of a high degree of mechanization in the direct construction operation, they emerge in the finished highway.

Throughout this succession of processing stages use is made of tremendous resources in the form of plant and equipment, which, in a continuous program of highway construction, undergo steady depreciation and require maintenance, repair, and replacement of buildings, machinery, and tools on account of wear and tear and obsolescence.

These requirements of highway construction cause business transactions in addition to the highway business transacted on the job. Each order for highway materials initiates the transaction of business in numerous places and in many industries. An order for steel requires the application of labor and equipment to materials purchased by steel mills from blast-furnace operators and other sources. Pig-iron manufacture causes the transaction of business in the conversion of iron ore, requiring the application of additional labor

to plant and equipment. The transportation of iron ore from the mines adds to the value of business already transacted. Finally, the mining of the iron ore further increases the value of business transacted. Each successive stage in the processing of materials represents the distribution of expense to labor, equipment, materials, and other expense, which items compose the cost of doing business. The total value of business thus transacted is the sum of the separate values involved in the several stages required for the complete processing of materials.

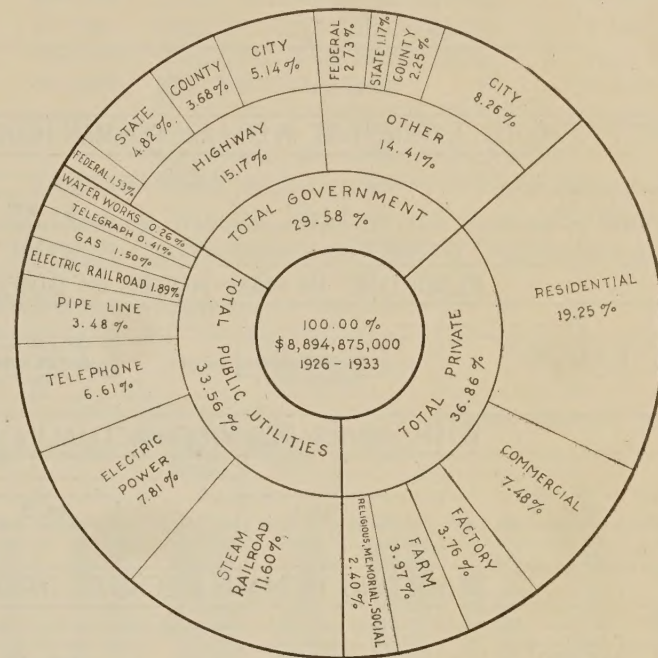


FIGURE 3.—Distribution of the average (1926-33) annual construction expenditure in the United States.

Sound management directs the application of labor in the processing of materials, and makes efficient use of every available mechanical means. Only by this combination is full value received for highway expenditures. A high degree of mechanical efficiency is an important adjunct of the agencies of production and distribution. Sacrifice of mechanical efficiency means higher cost, decreased volume of production, and ultimate reduction in pay rolls. Conversely, the use of efficient machinery and methods in construction mean lowered costs, increased productivity, and ultimate increase in pay rolls and the greatest return for funds expended.

FIRST DISTRIBUTION OF EXPENDITURES FOR HIGHWAYS

In analyzing highway expenditures a step-by-step procedure was carried on until all of an original \$100,000,000 expenditure had been distributed as salaries and wages to labor. The procedure involved, as a first step, the segregation of salaries and wages paid to direct labor on construction projects. In the next step distribution is made to producer-goods industries of all other expense, and, in the progressive distribution of this expense the salaries and wages paid to indirect labor are segregated. The remainder of the industrial expense incident to the original highway expenditure is composed of interest and margin

items, definitely forming a field for the reinvestment of payments made to large and small income groups. The third step traces payments which form a part of large incomes and which are reinvested in producer-goods industries (not unlike the original producer-goods investment), and also traces small incomes expended for the cost of living in the purchase of consumer goods (represented by retail trade). Ultimately, the entire original highway expenditure is distributed as salaries and wages and become labor's share in the total value of business thus created.

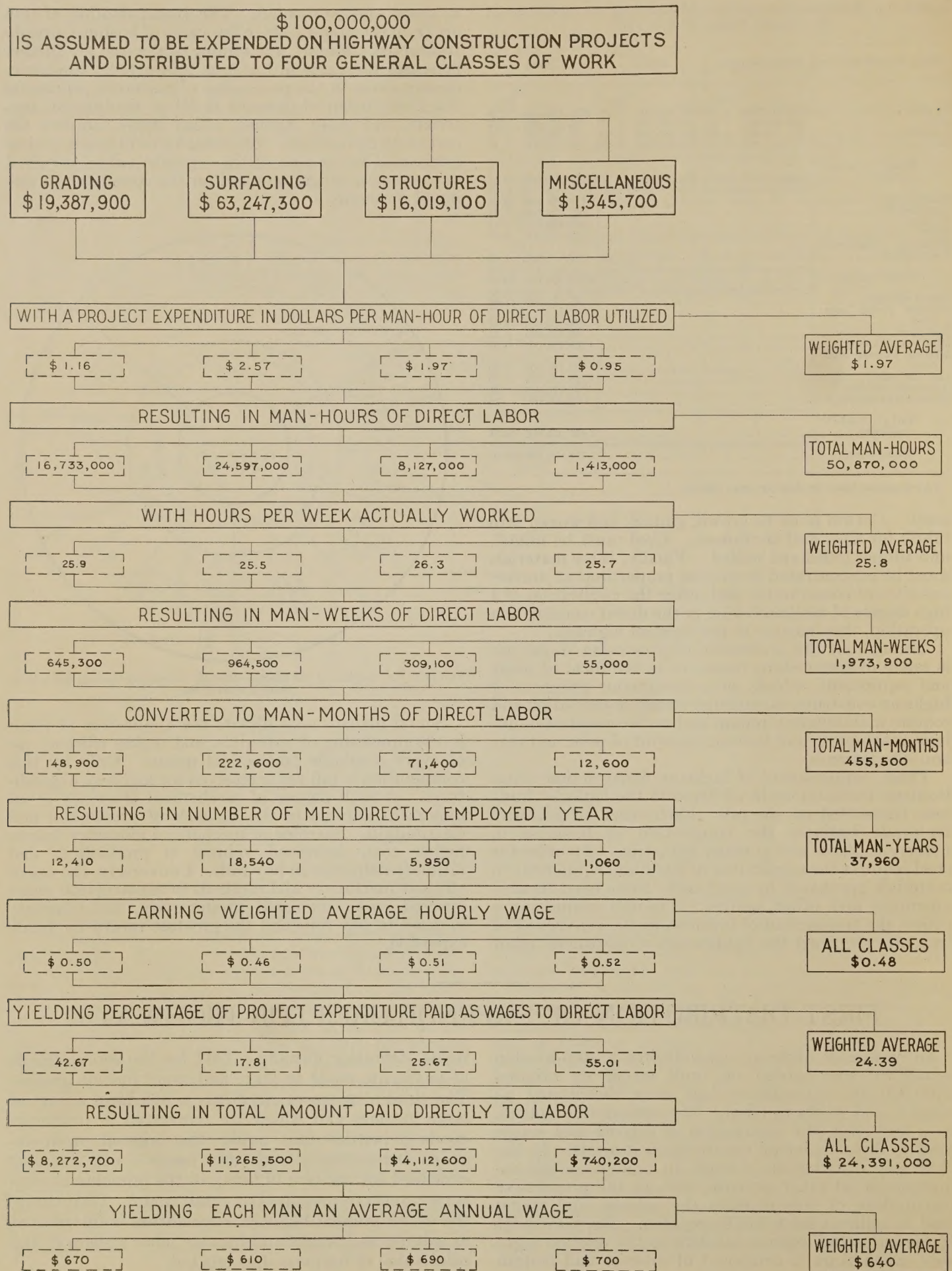


FIGURE 4.—Direct employment created by \$100,000,000 highway construction expenditure.

DIRECT LABOR PAYMENTS

Labor first shares in the initial or direct highway construction operation. The break-down of the direct operation expense into its elements is based on analysis of regular and special monthly field reports made to the Bureau of Public Roads by resident engineers and contractors on active construction projects.

Figure 4 summarizes the data concerning the direct or job labor. These data are derived from monthly field reports and from certified copies of contractor's pay rolls filed by contractors for each pay-roll period and summarized to show by projects the number of men employed, man-hours, and wages on the \$120,-000,000 Federal emergency highway construction program. Project data were assembled by States and by classes of work and totaled by sections of the United States, for the entire country, and for all classes of work. In addition, employment was distributed by months of the year to show the effects of weather limitations (fig. 5). There has been some distortion in seasonal employment in recent years because of the

classes using factors derived in field cost studies by the Bureau of Public Roads. Depreciation was calculated

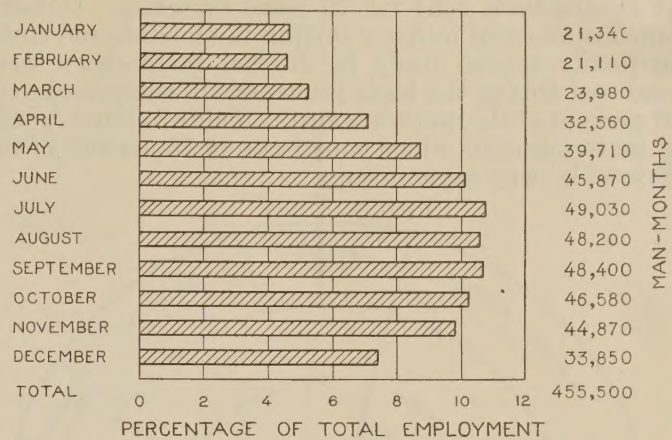


FIGURE 5.—Monthly distribution of highway construction employment.

by methods recommended by the Bureau of Internal Revenue and the Associated General Contractors 45, (6).

TABLE 2.—Equipment expense for \$100,000,000 highway construction expenditure

Type of equipment	Total cost of equipment	Annual depreciation and transportation costs			Annual charge for repairs and replacements			Interest	Insurance	Taxes
		Depreciation	Transportation	Total	Repairs and replacements	Transportation	Total			
Power shovels, cranes, and draglines.....	\$11,485,000	\$1,468,900	\$139,300	\$1,608,200	\$1,545,800	\$13,200	\$1,559,000	\$293,800	\$60,700	\$60,700
Graders and scrapers.....	2,720,000	396,400	39,300	435,700	417,100	3,600	420,700	79,300	16,400	16,400
Drilling equipment.....	1,483,000	214,400	7,900	222,300	225,700	1,900	227,600	42,900	8,900	8,900
Concrete-paving equipment.....	3,554,000	576,900	49,600	626,500	607,200	5,200	612,400	115,400	23,900	23,900
Bituminous-paving equipment.....	1,545,000	207,300	11,000	218,300	218,200	1,900	220,100	41,500	8,600	8,600
Tractors.....	5,061,000	705,300	41,300	746,600	742,200	6,300	748,500	141,000	29,200	29,200
Trucks.....	16,574,000	2,482,300	69,600	2,551,900	2,612,400	22,300	2,634,700	496,400	102,700	102,700
Other hauling equipment.....	2,341,000	395,500	41,700	437,200	416,300	3,600	419,900	79,100	16,400	16,400
Culvert and bridge equipment.....	1,506,000	237,500	11,600	249,100	250,000	2,100	252,100	47,500	9,800	9,800
Pumping equipment.....	865,000	142,500	42,600	185,100	150,000	1,300	151,300	28,500	5,900	5,900
Crushing, screening, and conveyor equipment.....	698,000	100,000	12,200	112,200	105,200	900	106,100	20,000	4,100	4,100
Total.....	47,832,000	6,927,000	466,100	7,393,100	7,290,100	62,300	7,352,400	1,385,400	286,600	286,600
Percentage distribution of totals.....		93.70	6.30	100.00	99.15	0.85	100.00			

Type of equipment	Fuel charge			Lubricants charge			Total equipment charge		
	Fuel	Transportation	Total	Lubricants	Transportation	Total	Equipment	Transportation	Total
Power shovels, cranes, and draglines.....	\$285,600	\$174,400	\$460,000	\$83,000	\$52,400	\$135,400	\$3,798,500	\$379,300	\$4,177,800
Graders and scrapers.....	2,400	1,400	3,800	8,400	5,300	13,700	936,400	49,600	986,000
Drilling equipment.....	112,500	68,800	181,300	31,600	20,000	51,600	644,900	98,600	743,500
Concrete-paving equipment.....	73,700	45,100	118,800	40,600	25,700	66,300	1,461,600	125,600	1,587,200
Bituminous-paving equipment.....	158,200	96,700	254,900	5,200	3,200	8,400	647,600	112,800	760,400
Tractors.....	201,100	122,900	324,000	26,500	16,700	43,200	1,874,500	187,200	2,061,700
Trucks.....	1,450,600	886,400	2,337,000	207,400	131,100	338,500	7,454,500	1,109,400	8,563,900
Other hauling equipment.....	600	300	900	11,700	7,400	19,100	936,000	53,000	989,000
Culvert and bridge equipment.....	34,600	21,200	55,800	5,300	3,300	8,600	594,500	38,200	632,700
Pumping equipment.....	59,400	36,300	95,700	7,900	5,000	12,900	400,100	85,200	485,300
Crushing, screening, and conveyor equipment.....	29,900	18,200	48,100	3,900	2,500	6,400	267,200	33,800	301,000
Total.....	2,408,600	1,471,700	3,880,300	431,500	272,600	704,100	19,015,800	2,272,700	21,288,500
Percentage distribution of totals.....	62.07	37.93	100.00	61.28	38.72	100.00	89.32	10.68	100.00

emphasis placed on winter work to relieve unemployment. Figure 4 shows that direct or job labor receives 24.39 percent of the direct highway expenditure.

EQUIPMENT COSTS

Table 2 summarizes the data concerning the equipment used. These data were derived from monthly field reports from active construction projects in the form of an inventory of equipment in use on Federal and State work costing \$263,000,000. Valuation, ownership expense, and cost of operation of equipment were calculated by units and applied to equipment

Table 2 shows the total cost of equipment, annual charge for depreciation, repair and replacement, interest, insurance, taxes, and supply items, together with the pertinent transportation items. The total charge for equipment is shown to be 21.29 percent of the direct highway expenditure.

MATERIAL COSTS

Table 3 shows the actual outlays for basic materials. These outlays are based on reported data for individual projects on the \$120,000,000 Federal emergency highway program and totaled for the United States. Data

reported included quantities, source, distance moved, type of haul, cost at source, hauling charge, and cost at contractor's yard for 10 basic materials. Miscellaneous material items occurring in amounts too small to justify special study for further break-down were prorated among the basic items, which comprised over 97 percent of the materials cost. Table 3 shows details of materials costs which constitute 48.75 percent of the direct highway expenditure.

projects previously made by the Bureau. These other expenses amount to 5.57 percent of the direct highway expenditure.

SUMMARY OF DISTRIBUTION OF DIRECT HIGHWAY EXPENDITURES

The highway industry may now be summarized in terms of all general items composing the direct project expenditure as follows:

Item:	Percent
Labor.....	24.39
Equipment.....	21.29
Materials.....	48.75
Other expense.....	5.57
Total.....	100.00

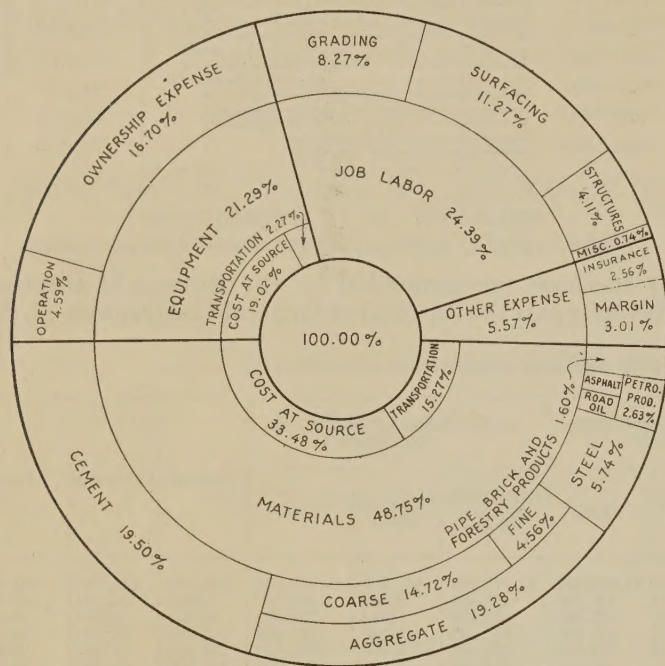


FIGURE 6.—Distribution of highway construction expenditures.

Other expense attached to highway construction includes bond premium, compensation and liability insurance, and taxes and margin, data concerning which were derived from cost studies of construction

Subdivisions of these items of direct cost are shown graphically in figure 6. The percentages shown hold fairly constant from year to year for the entire field of highway construction.

Variation in types of road and in sectional practices produce differences in cost, but in a large program many of the differences tend to cancel each other with the result that variations from the percentages in figure 6 are not large.

A period of high labor cost produces increased mechanical efficiency to increase output and results in approximately the same percentage payment to labor. Substantial increase in labor cost is usually accompanied by a proportional increase in the cost of other items, which in the final analysis are the result of labor costs. Thus the volume purchased by a given expenditure may vary but the expense items, expressed as percentages, remain substantially uniform from year to year.

Figure 7 shows the distribution of equipment expense. Similarly figure 8 shows the distribution of materials expense. These figures enable ready determination of the relative importance of the major subdivisions of highway costs.

TABLE 3.—Materials expense for \$100,000,000 highway construction expenditure

Material	Quantity	Weight	Distance moved	Haul	Hauling cost			Cost at source		Total cost at road plant		
					Amount	Per ton-mile	Per unit	Amount	Per unit	Amount	Per unit	Proportion of total
	Number	Tons	Miles	Ton-miles								Percent
Fine aggregate.....	4,776,000	4,776,000	35	167,173,000	\$2,429,900	\$0.0145	\$0.0508	\$2,128,300	\$0.446	\$4,558,200	\$0.954	9.35
Coarse aggregate.....	18,192,000	18,192,000	18	335,498,000	5,628,200	.0168	.309	9,092,000	.500	14,720,200	.809	30.20
Cement.....	10,433,700	1,961,600	184	360,017,000	5,169,500	.0144	.495	14,332,600	1.374	19,502,100	1.869	40.01
Iron and steel.....	214,005,000	107,000	472	50,494,000	927,500	.0184	.004	4,811,700	.023	5,739,200	.027	11.77
Road oil.....	22,207,000	77,800	369	28,656,000	484,100	.0169	.022	747,900	.034	1,232,000	.056	2.53
Asphalt.....	21,353,000	89,200	313	27,894,000	396,200	.0142	.019	1,004,600	.047	1,400,800	.066	2.87
Lumber.....	18,060	30,200	485	14,637,000	113,500	.0078	6.281	534,600	29.597	648,100	35.878	1.33
Brick.....	4,080	19,800	4	79,000	6,100	.0771	1.500	97,900	23.998	104,000	25.498	.21
Pipe.....	1,038,600	14,600	236	3,432,000	116,400	.0339	.112	727,500	.701	843,900	.813	1.73
Total.....		25,268,100	39	987,880,000	15,271,400	.0155		33,477,100		48,748,500		100.00

¹ Sand.

² Gravel and crushed stone.

³ Includes 1,426,885 gallons of tar; total cost, \$128,530.

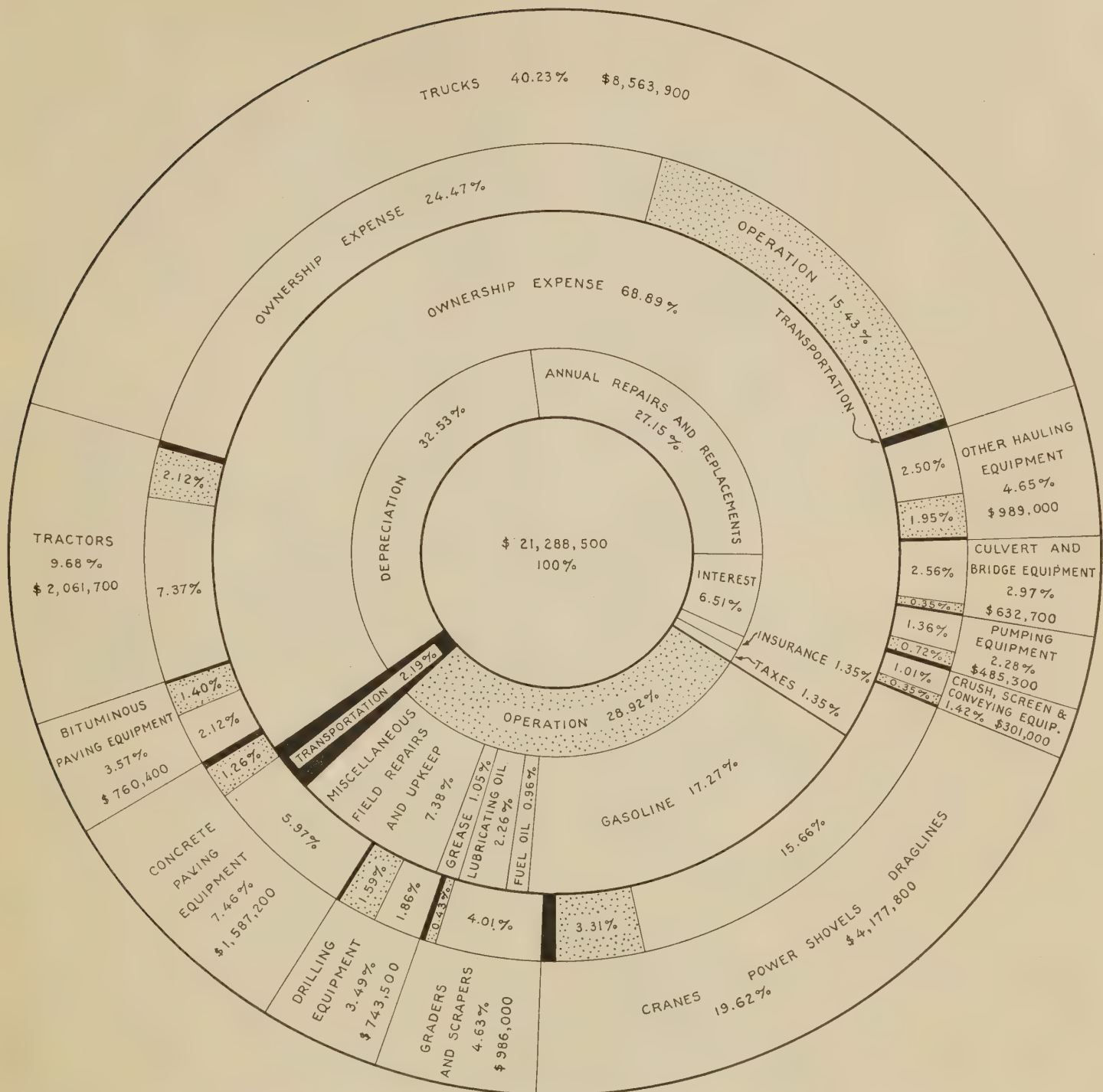
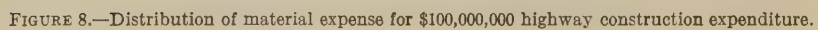


FIGURE 7.—Distribution of equipment expense for \$100,000,000 highway construction expenditure. Stippling indicates operation costs and black indicates transportation costs.



DISTRIBUTION OF HIGHWAY EXPENDITURES TO BASIC INDUSTRIES

Break-down no. 1 of table 4 shows the final detailed subdivision of the direct highway expenditure. Payments as salaries and wages on the job and for equipment, materials, and supplies are shown. As a basis for later analysis of these payments, break-downs 2 to 24 of table 5 show percentages derived for basic industries and applicable to the items of break-down no. 1. In deriving these percentages the general outline of break-down no. 1 was followed.

Each break-down carries the items "salaries and wages", "interest", and "margin." In later analysis the last two items are recapitulated separately for distribution as reinvestment. The transportation items of break-down no. 1 are later consolidated with other transportation items and distributed according to the percentages of break-down no. 2.

TABLE 4.—Analysis of highway expenditure of \$100,000,000
BREAK-DOWN NO. 1.—DIRECT HIGHWAY EXPENDITURE OF \$100,000,000

Item	At source	Transportation	Item total
Salaries and wages.....			\$24,391,000
Equipment:			
Ownership expense:			
Depreciation.....	\$6,927,000	\$466,100	7,393,100
Repair and replacement.....	7,290,100	62,300	7,352,400
Interest.....			1,385,400
Insurance.....			286,600
Taxes.....			286,600
Operating expense—Petroleum products:			
Fuel.....	2,408,600	1,471,700	3,880,300
Lubricants.....	431,500	272,600	704,100
Total.....			21,288,500
Materials:			
Aggregate, quarrying.....	11,220,300	8,058,100	19,278,400
Cement.....	14,332,600	5,169,500	19,502,100
Iron and steel.....	4,811,700	927,500	5,739,200
Petroleum products.....	1,752,500	880,300	2,632,800
Pipe.....	727,500	116,400	843,900
Forestry products.....	534,600	113,500	648,100
Brick.....	97,900	6,100	104,000
Total.....			48,748,500
Other expense:			
Insurance:			
Bond premium.....			1,500,000
Compensation and liability.....			609,800
Taxes.....			450,100
Margin.....			3,012,100
Total.....			5,572,000
Industry total.....		17,544,100	100,000,000

TABLE 5.—Analysis of expenditures of basic industries on a percentage basis

BREAK-DOWN NO. 2—TRANSPORTATION

Item	At source	Transportation	Total
	Percent	Percent	Percent
Salaries and wages.....			51.76
Equipment:			
Ownership expense:			
Interest.....			4.16
Taxes.....			1.55
Insurance.....			1.54
Operating expense:			
Petroleum products:			
Fuel.....	0.27	(1)	.27
Lubricants.....	.15		.15
Coal and coke.....	3.12		3.12
Power.....			.39
Total.....			11.18
Materials:			
Iron and steel.....	10.58		10.58
Forestry products.....	1.65		1.65
Nonferrous-metals refining.....	.38		.38
Aggregate, quarrying.....	.27		.27
Brick.....	.22		.22

TABLE 5.—Analysis of expenditures of basic industries on a percentage basis—Continued

BREAK-DOWN NO. 2—TRANSPORTATION—Continued

Item	At source	Transportation	Total
	Percent	Percent	Percent
Materials—Continued.			
Cement.....	0.18		0.18
Aggregate.....	.10		.10
Total.....			13.38
Other expense:			
Insurance—Compensation and liability.....			1.83
Taxes.....			4.22
Laboratory.....			1.09
Advertising and development.....			2.17
Margin.....			14.37
Total.....			23.68
Industry total.....			100.00

BREAK-DOWN NO. 3—PLANT AND EQUIPMENT EXPENDITURE FOR DEPRECIATION, REPAIR, AND REPLACEMENT

Salaries and wages.....			40.31
Equipment:			
Ownership expense:			
Interest.....			4.73
Insurance.....			.95
Taxes.....			.86
Operating expense:			
Petroleum products:			
Fuel.....	0.45	0.27	.72
Lubricants.....	.20	.14	.34
Coal and coke.....	.25	.30	.55
Power.....			.64
Total.....			8.79
Materials:			
Iron and steel.....	12.75	.82	13.57
Rubber.....	5.15	.22	5.37
Forestry products.....	3.06	.68	3.74
Cement.....	1.34	.49	1.83
Brick.....	1.65	.10	1.75
Nonferrous-metals refining.....	1.60	.03	1.63
Aggregate, quarrying.....	.80	.57	1.37
Total.....			29.26
Other expense:			
Insurance:			
Bond premium.....			.12
Compensation and liability.....			.88
Taxes.....			1.37
Advertising and development.....			1.90
Laboratory.....			.93
Margin.....			16.44
Total.....			21.64
Industry total.....		3.62	100.00

BREAK-DOWN NO. 4—AGGREGATE, QUARRYING

Salaries and wages.....			41.74
Equipment:			
Ownership expense:			
Depreciation.....			7.29
Repair and replacement.....	10.25	0.52	10.77
Interest.....			2.43
Insurance.....			.49
Taxes.....			.49
Operating expense:			
Petroleum products:			
Fuel.....	1.38	.84	2.22
Lubricants.....	1.40	.97	2.37
Coal and coke.....	.75	.93	1.68
Power.....			4.81
Total.....			32.55
Materials—Explosives.....	12.53	.84	13.37
Other expense:			
Insurance—Compensation and liability.....			.84
Taxes.....			2.20
Laboratory.....			1.08
Advertising and development.....			2.84
Margin.....			5.38
Total.....			12.34
Industry total.....		4.10	100.00

¹ Expenditure for transportation included in other items of transportation break down.

TABLE 5.—Analysis of expenditures of basic industries on a percentage basis—Continued

BREAK-DOWN NO. 5—INSURANCE AND TAXES

Item	At source	Transportation	Total
	Percent	Percent	Percent
Salaries and wages.....			47.00
Plant and equipment.....	32.20	7.80	40.00
Interest.....			13.00
Industry total.....		7.80	100.00

BREAK-DOWN NO. 6—CEMENT

Salaries and wages.....			24.94
Equipment:			
Ownership expense:			
Depreciation.....			6.95
Repair and replacement.....	8.75	0.44	9.19
Interest.....			5.94
Insurance.....			1.19
Taxes.....			1.19
Operating expense:			
Petroleum products:			
Fuel.....	1.85	1.12	2.97
Lubricants.....	1.59	.99	2.58
Coal and coke.....	4.99	6.21	11.20
Power.....			5.79
Total.....			47.00
Materials:			
Aggregate, quarrying.....	6.68	1.35	8.03
Metallic-ore mining.....	1.22	1.25	2.47
Explosives.....	1.38	.09	1.47
Containers.....	.87	.06	.93
Total.....			12.90
Other expense:			
Insurance—Compensation and liability.....			.47
Taxes.....			2.00
Laboratory.....			3.85
Advertising and development.....			1.14
Margin.....			7.70
Total.....			15.16
Industry total.....		11.51	100.00

BREAK-DOWN NO. 7—IRON AND STEEL

Salaries and wages.....			22.67
Equipment:			
Ownership expense:			
Depreciation.....			4.97
Repair and replacement.....	4.60	0.23	4.83
Interest.....			2.65
Insurance.....			.56
Taxes.....			.55
Operating expense:			
Petroleum products:			
Fuel.....	.69	.42	1.11
Lubricants.....	.36	.23	.59
Coal and coke.....	8.97	7.27	16.24
Power.....			.85
Total.....			32.34
Materials:			
Metallic-ore mining.....	17.85	10.71	28.56
Nonferrous-metals refining.....	4.45	.08	4.53
Aggregate, quarrying.....	1.49	.30	1.79
Total.....			34.88
Other expense:			
Insurance—Compensation and liability.....			.49
Taxes.....			.87
Laboratory.....			1.00
Advertising and development.....			1.08
Margin.....			6.67
Total.....			10.11
Industry total.....		19.24	100.00

BREAK-DOWN NO. 8—PETROLEUM PRODUCTS

Salaries and wages.....			29.80
Equipment:			
Ownership expense:			
Depreciation.....			12.81
Repair and replacement.....	10.39	0.51	10.90
Interest.....			5.48
Insurance.....			1.12
Taxes.....			1.11

TABLE 5.—Analysis of expenditures of basic industries on a percentage basis—Continued

BREAK-DOWN NO. 8—PETROLEUM PRODUCTS—Continued

Item	At source	Transportation	Total
	Percent	Percent	Percent
Equipment—Continued.			
Operating expense:			
Coal and coke.....	0.13	0.20	0.33
Power.....			.28
Total.....			32.03
Materials:			
Crude oil (petroleum products).....	(2)	15.20	15.20
Containers.....	2.10	.14	2.24
Nonferrous-metals refining.....	.77	.40	1.17
Total.....			18.61
Other expenses:			
Insurance—Compensation and liability.....			.39
Taxes.....			2.45
Laboratory.....			1.78
Advertising and development.....			1.88
Margin.....			13.06
Total.....			19.56
Industry total.....		16.45	100.00

BREAK-DOWN NO. 9—COAL AND COKE

Salaries and wages.....			61.42
Equipment:			
Ownership expense:			
Depreciation.....			10.50
Repair and replacement.....	5.66	0.29	5.95
Interest.....			5.13
Insurance.....			1.02
Taxes.....			1.02
Operating expense:			
Petroleum products:			
Fuel.....	.62	.39	1.01
Lubricants.....	.38	.23	.61
Power.....			2.57
Total.....			27.81
Materials—Explosives.....	1.47	.10	1.57
Other expense:			
Insurance.....			1.41
Taxes.....			1.10
Advertising and development.....			.59
Margin.....			6.10
Total.....			9.20
Industry total.....		1.01	100.00

BREAK-DOWN NO. 10—POWER

Salaries and wages.....			21.65
Equipment:			
Ownership expense:			
Depreciation.....			6.33
Repair and replacement.....	6.81	0.35	7.16
Interest.....			15.88
Insurance.....			1.27
Taxes.....			5.22
Operating expense:			
Petroleum products:			
Fuel.....	1.37	.82	2.19
Lubricants.....	.81	.50	1.31
Coal and coke.....	3.02	1.51	4.53
Total.....			43.89
Other expense:			
Insurance—Compensation and liability.....			.29
Taxes.....			3.63
Advertising and development.....			2.59
Margin.....			27.95
Total.....			34.46
Industry total.....		3.18	100.00

BREAK-DOWN NO. 11—METALLIC-ORE MINING

Salaries and wages.....			35.87
Equipment:			
Ownership expense:			
Depreciation.....			8.35
Repair and replacement.....	5.46	0.28	5.74

² Expenditure for petroleum products at source included in other items of petroleum products break-down. Similarly, expenditures for other products at source are included in other items of their respective breakdowns.

TABLE 5.—Analysis of expenditures of basic industries on a percentage basis—Continued

BREAK-DOWN NO. 11—METALLIC-ORE MINING—Continued

Item	At source	Transportation	Total
	Percent	Percent	Percent
Equipment—Continued.			
Ownership expense—Continued.			
Interest.....			3.16
Insurance.....			.63
Taxes.....			.63
Operating expense:			
Petroleum products:			
Fuel.....	1.89	1.15	3.04
Lubricants.....	1.12	.70	1.82
Coal and coke.....	1.03	1.27	2.30
Power.....			6.59
Total.....			32.26
Materials:			
Metallic-ore mining.....		4.24	4.24
Explosives.....	11.42	.74	12.16
Total.....			16.40
Other expense:			
Insurance—Compensation and liability.....			.72
Taxes.....			.78
Advertising and development.....			2.72
Margin.....			11.25
Total.....			15.47
Industry total.....		8.38	100.00

BREAK-DOWN NO. 12—FORESTRY PRODUCTS

Salaries and wages.....			52.99
Equipment:			
Ownership expense:			
Depreciation.....			3.17
Repair and replacement.....	7.49	0.37	7.86
Interest.....			3.16
Insurance.....			.63
Taxes.....			.63
Operating expense:			
Petroleum products:			
Fuel.....	.79	.48	1.27
Lubricants.....	.59	.36	.95
Coal and coke.....	1.51	1.86	3.37
Power.....			4.47
Total.....			25.51
Materials—Forestry products.....		5.42	5.42
Other expense:			
Insurance—Compensation and liability.....			1.38
Taxes.....			2.74
Advertising and development.....			1.84
Margin.....			10.12
Total.....			16.08
Industry total.....		8.49	100.00

BREAK-DOWN NO. 13—ADVERTISING AND DEVELOPMENT

Salaries and wages.....			37.48
Equipment:			
Ownership expense:			
Depreciation.....			16.41
Repair and replacement.....	9.69	0.48	10.17
Interest.....			5.85
Taxes.....			1.17
Insurance.....			1.17
Operating expense:			
Petroleum products:			
Fuel.....	.85	.52	1.37
Lubricants.....	.46	.32	.78
Coal and coke.....	.62	.77	1.39
Power.....			5.81
Total.....			44.12
Materials:			
Advertising and development.....		.46	.46
Forestry products.....	7.48	.91	8.39
Total.....			8.85
Other expense:			
Insurance—Compensation and liability.....			.51
Taxes.....			1.06
Margin.....			7.98
Total.....			9.55
Industry total.....		3.46	100.00

TABLE 5.—Analysis of expenditures of basic industries on a percentage basis—Continued

BREAK-DOWN NO. 14—EXPLOSIVES

Item	At source	Transportation	Total
	Percent	Percent	Percent
Salaries and wages.....			20.55
Equipment:			
Ownership expense:			
Depreciation.....			12.41
Repair and replacement.....	10.03	0.50	10.53
Interest.....			5.05
Insurance.....			1.61
Taxes.....			1.61
Operating expense:			
Petroleum products:			
Fuel.....	.74	.44	1.18
Lubricants.....	.44	.27	.71
Coal and coke.....	.95	1.17	2.12
Power.....			1.40
Total.....			36.62
Materials:			
Explosives.....		8.64	8.64
Aggregate, quarrying.....	10.97	2.90	13.87
Container.....	2.10	.14	2.24
Total.....			24.75
Other expense:			
Insurance—Compensation and liability.....			.40
Taxes.....			2.69
Laboratory.....			.75
Advertising and development.....			1.23
Margin.....			13.01
Total.....			18.08
Industry total.....		14.06	100.00

BREAK-DOWN NO. 15—LABORATORY

Salaries and wages.....			37.03
Equipment:			
Ownership expense:			
Depreciation.....			6.38
Repair and replacement.....	4.94	0.25	5.19
Interest.....			4.57
Insurance.....			.76
Taxes.....			.78
Operating expense:			
Petroleum products:			
Fuel.....	.23	.14	.37
Lubricants.....	.09	.06	.15
Coal and coke.....	.16	.19	.35
Power.....			.52
Total.....			19.07
Materials:			
Iron and steel.....	13.86	2.54	16.40
Nonferrous-metals refining.....	7.29	.13	7.42
Aggregate, quarrying.....	3.53	1.83	5.36
Total.....			29.18
Other expense:			
Insurance—Compensation and liability.....			.72
Taxes.....			1.32
Advertising and development.....			1.56
Margin.....			11.12
Total.....			14.72
Industry total.....		5.14	100.00

BREAK-DOWN NO. 16—RUBBER

Salaries and wages.....			21.09
Equipment:			
Ownership expense:			
Depreciation.....			7.30
Repair and replacement.....	4.17	0.21	4.38
Interest.....			2.09
Insurance.....			.42
Taxes.....			.42
Operating expense:			
Petroleum products:			
Fuel.....	.03	.02	.05
Lubricants.....	.02	.01	.03
Coal and coke.....	.28	.34	.62
Power.....			.71
Total.....			16.02
Materials:			
Agricultural products:			
Cotton fabric.....	19.50	.86	20.36
Crude rubber.....	27.53	1.53	29.06

TABLE 5.—Analysis of expenditures of basic industries on a percentage basis—Continued

BREAK-DOWN NO. 16—RUBBER—Continued

Item	At source	Transportation	Total
	Percent	Percent	Percent
Materials—Continued.			
Aggregate, quarrying.....	2.50	1.30	3.80
Total.....			53.22
Other expense:			
Insurance—Compensation and liability.....			.42
Taxes.....			.88
Laboratory.....			1.47
Advertising and development.....			1.21
Margin.....			5.69
Total.....			9.67
Industry total.....		4.27	100.00

BREAK-DOWN NO. 17—BRICK

Salaries and wages.....			46.52
Equipment:			
Ownership expense:			
Depreciation.....			4.60
Repair and replacement.....	5.27	0.27	5.54
Interest.....			3.29
Insurance.....			.66
Taxes.....			.66
Operating expense:			
Petroleum products:			
Fuel.....	2.48	1.52	4.00
Lubricants.....	1.36	.83	2.19
Coal and coke.....	3.30	4.10	7.40
Power.....			3.46
Total.....			31.80
Other expense:			
Insurance—Compensation and liability.....			.98
Taxes.....			2.20
Advertising and development.....			2.70
Laboratory.....			1.18
Margin.....			14.62
Total.....			21.68
Industry total.....		6.72	100.00

BREAK-DOWN NO. 18—AGRICULTURAL PRODUCTS

Salaries and wages.....			24.23
Equipment:			
Ownership expense:			
Depreciation.....			13.75
Repair and replacement.....	19.05	0.98	20.03
Interest.....			13.68
Taxes.....			6.48
Insurance.....			1.40
Operating expense:			
Petroleum products:			
Fuel.....	2.82	1.72	4.54
Lubricants.....	.44	.30	.74
Power.....			2.67
Total.....			63.29
Other expense:			
Taxes.....			.60
Margin.....			11.88
Total.....			12.48
Industry total.....		3.00	100.00

BREAK-DOWN NO. 19—PIPE

Salaries and wages.....			18.58
Equipment:			
Ownership expense:			
Depreciation.....			4.61
Repair and replacement.....	2.74	0.13	2.87
Interest.....			2.30
Insurance.....			.46
Taxes.....			.46
Operating expense:			
Petroleum products:			
Fuel.....	.48	.29	.77
Lubricants.....	.23	.15	.38
Power.....			1.30
Total.....			13.15
Materials—Iron and steel.....	45.78	8.40	54.18

TABLE 5.—Analysis of expenditures of basic industries on a percentage basis—Continued

BREAK-DOWN NO. 19—PIPE—Continued

Item	At source	Transportation	Total
	Percent	Percent	Percent
Other expense:			
Insurance—Compensation and liability.....			0.38
Taxes.....			2.20
Advertising and development.....			4.99
Margin.....			6.52
Total.....			14.09
Industry total.....		8.97	100.00

BREAK-DOWN NO. 20—NONFERROUS-METALS REFINING

Salaries and wages.....			9.19
Equipment:			
Ownership expense:			
Depreciation.....			3.23
Repair and replacement.....	2.11	0.11	2.22
Interest.....			1.22
Insurance.....			.24
Taxes.....			.24
Operating expense:			
Petroleum products:			
Fuel.....	.72	.44	1.16
Lubricants.....	.39	.25	.64
Coal and coke.....	.88	1.07	1.95
Power.....			.81
Total.....			11.71
Materials—Metallic-ore mining.....	64.29	8.93	73.22
Other expense:			
Insurance—Compensation and liability.....			.18
Taxes.....			.30
Laboratory.....			.27
Advertising and development.....			.78
Margin.....			4.35
Total.....			5.88
Industry total.....		10.80	100.00

BREAK-DOWN NO. 21—CONTAINERS

Salaries and wages.....			21.07
Equipment:			
Ownership expense:			
Depreciation.....			3.51
Repair and replacement.....	3.35	0.16	3.51
Interest.....			1.83
Taxes.....			.36
Insurance.....			.36
Operating expense:			
Petroleum products:			
Fuel.....	.12	.07	.19
Lubricants.....	.06	.04	.10
Coal and coke.....	.14	.17	.31
Power.....			.83
Total.....			11.00
Materials:			
Iron and steel.....	28.03	1.81	29.84
Lumber.....	14.65	1.78	16.43
Nonferrous-metals refining.....	.52	.01	.53
Agricultural products—Cotton fabric.....	10.91	.49	11.40
Total.....			58.20
Other expense:			
Insurance—Compensation and liability.....			.43
Taxes.....			2.07
Advertising and development.....			.43
Margin.....			6.80
Total.....			9.73
Industry total.....		4.53	100.00

BREAK-DOWN NO. 22—RETAIL TRADE

Salaries and wages.....			14.28
Equipment:			
Ownership expense:			
Depreciation.....			2.37
Repair and replacement.....	2.24	0.12	2.36
Interest.....			1.17
Taxes.....			.26
Insurance.....			.25
Operating expense:			
Petroleum products:			
Fuel.....	.18	.10	.28
Lubricants.....	.03	.02	.05

TABLE 5.—*Analysis of expenditures of basic industries on a percentage basis—Continued*

BREAK-DOWN NO. 22—RETAIL TRADE—Continued

Item	At source	Transportation	Total
	Percent	Percent	Percent
Equipment—Continued.			
Operating expense—Continued.			
Power.....			1.05
Total.....			7.79
Materials—Wholesale trade.....	60.18	11.58	71.76
Other expense:			
Insurance and taxes.....			.75
Advertising and development.....			.13
Margin.....			5.29
Total.....			6.17
Industry total.....		11.82	100.00

BREAK-DOWN NO. 23—WHOLESALE TRADE

Salaries and wages.....			7.80
Equipment:			
Ownership expense:			
Depreciation.....			3.00
Repair and replacement.....	2.87	0.13	3.00
Interest.....			2.48
Taxes.....			.60
Insurance.....			.59
Operating expense:			
Petroleum products:			
Fuel.....	.38	.17	.55
Lubricants.....	.06	.04	.10
Power.....			1.76
Total.....			12.08
Materials:			
Manufacturing.....	50.40	2.60	53.00
Agricultural products.....	8.62	.22	8.84
Metallic-ore mining.....	2.01	.08	2.09
Petroleum products.....	1.07	.08	1.15
Forestry products.....	.92	.06	.98
Total.....			66.06
Other expense:			
Insurance—Compensation and liability.....			.19
Taxes.....			1.68
Advertising and development.....			1.67
Margin.....			10.52
Total.....			14.06
Industry total.....		3.38	100.00

BREAK-DOWN NO. 24—MANUFACTURING

Salaries and wages.....			31.51
Equipment:			
Ownership expense:			
Depreciation.....			7.53
Repairs and replacement.....	7.29	0.24	7.53
Interest.....			8.90
Taxes.....			.89
Insurance.....			.89
Operating expense:			
Petroleum products:			
Fuel.....	1.06	.14	1.20
Lubricants.....	.18	.03	.21
Coal and coke.....	2.04	.51	2.55
Power.....			.93
Total.....			30.63
Materials:			
Agricultural products.....	19.26	.44	19.70
Petroleum products.....	2.04	.26	2.30
Metallic-ore mining.....	4.49	.16	4.65
Forestry products.....	2.06	.13	2.19
Total.....			28.84
Other expense:			
Insurance—Compensation and liability.....			.79
Taxes.....			.90
Advertising and development.....			1.28
Margin.....			6.05
Total.....			9.02
Industry total.....		1.91	100.00

The basic industries covered by break-downs 2 to 24 were selected on the assumption that a reasonable number of industries of general scope would be prefer-

able to a great number of limited scope. The arrangement used greatly simplified the subsequent processes of distribution without substantially affecting the accuracy necessary to establish justifiable conclusions. Under this arrangement, highway-construction materials, such as road oil, asphalt, and supplies used in equipment operation such as gasoline, fuel oil, and lubricants, are all classed as petroleum products and are assigned to a general industry of that name covering the general field of production and refining. The basic industries first selected, together with the expense items assigned to them, are as follows:

Aggregate (quarrying):	Forestry products:
Fine aggregate.	Lumber.
Coarse aggregate.	Paper products.
Cement.	Brick.
Iron and steel:	Culvert pipe.
Reinforcing steel.	Insurance and taxes:
Structural steel.	Compensation insurance.
Petroleum products:	Bond premium.
Road oil.	Taxes.
Asphalt.	Plant and equipment:
Gasoline.	Depreciation.
Fuel oil.	Repair and replacement.
Lubricants.	

In furnishing the needs of highway construction, these industries incur expenses for salaries and wages, equipment, supplies, materials, and other items. Purchases are made from other industries in sufficient amounts to justify their analysis in tracing the effect of highway expenditures. The cement and aggregate industries carry on quarrying and must purchase powder and blasting supplies from the explosives industry. Tires and rubber goods must be purchased from the rubber industry for plant and equipment use. The need for cotton fabric for tires and for cotton sacks in the cement industry introduces both the container industry and agricultural products. The steel and explosives industries purchase ores and bring mining into the field. Most concerns set aside funds for research and for advertising and development. These industries, together with the former group, comprise the basic industries studied in tracing the highway expenditure back to the farms, forests, mines, and quarries.

The percentage distribution of industrial expense varies widely between periods of prosperity and of depression. The percentage distribution of industrial expense used in this analysis is intended to represent that made in average establishments over a period of years. The industry break-downs therefore reflect the items of actual expense based on a normal supply and a normal demand. The effects of peak production, utilization of products from storage, and reduction or disappearance of margin in periods of depression have been eliminated. The result calculated in this manner is that of a long-time trend in which industries operate at a normal rate in producing goods used in highway construction.

Break-downs nos. 2 to 24 of table 5 show the percentage distribution of all items of expense for the several industries involved. The break-down of each industry is assigned a number. The references used in making the break-downs are given in the bibliography. Information was drawn from various sources and was not always consistent. Minor variations in the several subdivisions of an industry are inconsequential in light of later distributions, which tend to dissipate error by successive division rather than to accumulate it.

PAYMENTS TO CEMENT INDUSTRY ANALYZED AS EXAMPLE OF METHODS USED

The cement industry (break-down no. 6) is taken as an example of the procedure used in the break-down. Table 4 shows that the cement costs about \$19,000,000 of the \$100,000,000 expenditure for highways. Of this amount about \$5,000,000 is for transportation, leaving about \$14,000,000 that is spent directly for cement. Fourteen million dollars will purchase about 10,000,000 barrels of cement. The analysis of the cost of manufacturing 10,000,000 barrels of cement is typical of the procedure used in all the break-downs.

The Census of Manufactures of the United States Department of Commerce (17, 25) provides data that enable the subdivision of the value of portland cement (natural, puzzolan, etc., cements excluded) into general expense items. It is found that an average of the data on value of product and on volume of business for the years 1927 and 1931 closely approximates the estimated normal in this industry. In these 2 years, over 300,000,000 barrels of cement having a total value of nearly \$430,000,000 were shipped. Table 6 shows the division of payments to this industry into general items.

TABLE 6.—General expense items of the cement industry for years 1927 and 1931 combined

Item	Total expenditure	Cost per barrel	Percentage of sale price
	Dollars	Cents	Percent
Salaries.....	26,556,500	8.52	6.20
Wages.....	80,301,400	25.75	18.74
Materials and containers.....	84,093,200	26.97	19.63
Fuel and power.....	85,537,300	27.44	19.96
Profits and production costs ¹	151,902,800	48.72	35.47
Total.....	428,391,200	137.40	100.00

¹ Includes expense items such as depreciation, interest, margin, insurance, taxes, rent, advertising, development, and other miscellaneous items.

With the exception of salaries and wages, the general items can be broken down into raw materials, manufactured and semimanufactured products of other industries, insurance and taxes, interest, and margin. In this analysis, only the more important items entering into the cost of the finished product are considered. A detailed treatment of the cost of materials and supplies would include dozens of minor items that would have a negligible effect but would greatly complicate the analysis.

Table 7 shows the division of wages in the cement industry according to types of work performed based on data published by the Bureau (9).

TABLE 7.—Division of wages in the cement industry

Operation	Wages per barrel of cement	Percentage of sale price
	Cents	Percent
Manufacturing.....	10.69	7.78
Quarrying.....	5.02	3.65
Packing and shipping.....	3.78	2.75
Repairs.....	2.54	1.85
Power.....	2.50	1.82
Laboratory.....	1.22	.89
Total.....	25.75	18.74

The fuel and power item shown in table 6 is distributed to other industries in table 8. The distribution is based on data from the report Cement Industry (37) and from the Census of Manufactures (25).

TABLE 8.—Cost of fuel and power per barrel of cement

Item	Unit price	Per barrel of cement		Percentage of sale price
		Quantity	Cost	
Coal.....	\$2.85 per ton.....	107.9 pounds.....	Cents 15.39	Percent 11.20
Natural gas.....	\$0.107 per 1,000 cubic feet.....	249.8 cubic feet.....	2.67	1.94
Oil and gasoline.....	\$0.025 per gallon.....	0.6 gallon.....	1.42	1.03
Power.....	\$0.882 per 100 kilowatt-hours.....	9.02 kilowatt-hours.....	7.96	5.79
Total.....			27.44	19.96

Under the item "materials and containers" there are included the costs of cement rock or limestone and clay, gypsum, and explosives, as well as supplies other than the fuel and power needed to operate the cement mill. The average quantities of material per barrel of cement were determined from Mineral Resources of the United States (29, 30). By applying average prices of the materials to their quantities, the cost and percentage of the total cost of cement represented by materials can be determined. Table 9 shows the cost of materials and mill supplies required per barrel of cement.

TABLE 9.—Cost of materials and mill supplies per barrel of cement

Item	Unit price	Per barrel of cement		Percentage of sale price
		Quantity	Cost	
Cement rock or limestone and clay...	¹ \$0.50	0.221 ton.....	Cents 11.03	Percent 8.03
Gypsum.....	¹ 5.00	0.0068 ton.....	3.39	2.47
Explosives.....	² 13.65	0.148 pound.....	2.02	1.47
Containers.....			1.28	0.93
Total.....			17.72	12.90
Materials and containers (from table 6.)			26.97	19.63
Balance for mill supplies.....			9.25	6.73

¹ Per ton.

² Per 100 pounds.

The general item "profits and production costs" of table 6 plus the "balance for mill supplies" of table 9 represents ownership expense of the plant, repair and replacement, and other expense, such as insurance and taxes, laboratory, advertising and development, and margin.

Depreciation and repair and replacement represent the cost to a manufacturer of maintaining his plant at a constant value. The value of the operating cement plants is placed at about \$350,000,000. If these plants have an average life of 15 years, a charge of 16.45 cents per barrel is necessary with an average annual production of 130,000,000 barrels to replace the plant exclusive of land costs (9 percent of total plant value).

With the exception of lubricants, the charge for mill supplies can be classed as repair and replacement. Table 10 shows the costs of depreciation and repair and replacement per barrel of cement produced.

TABLE 10.—*Cost of depreciation and repair and replacement per barrel of cement*

Item	Cost per barrel	Percentage of sale price
	<i>Cents</i>	<i>Percent</i>
Mill supplies.....	9.25	6.73
Lubricants ¹	3.64	2.58
Repair and replacement from mill supplies.....	5.71	4.15
Depreciation and other repair and replacement.....	16.45	11.99
Total.....	22.16	16.14

¹ Deduct from mill supplies to derive repair and replacement cost.

No sharp line of demarcation exists between the cost of depreciation and cost of repair and replacement. Thus, one plant may be operated several years by making only necessary repairs and then be practically obsolete, having suffered maximum depreciation; another may be modernized every few years and remain at nearly the same value indefinitely, at a higher cost for repair and replacement.

In statements of cement companies representing 44 percent of the capacity in the United States (11), their bonded indebtedness was given as \$95,000,000, and the par value of their preferred stock was \$97,500,000. Assuming a 5-percent interest charge on bonds and 6 percent on preferred stock, the total interest charge amounts to \$10,600,000 annually, or 8.16 cents per barrel for an annual production of 130,000,000 barrels.

Exact rates of taxation imposed throughout the industry are not known. A property tax of 1 percent on 60 percent of the plant value and an income tax of 2 percent of the total sales value were assumed as reasonable figures.

Records of the Associated General Contractors of America, Inc. (6), indicate that insurance on plant and equipment is about equal to property taxes. In addition, compensation and liability insurance on employees amounts to about 2.5 percent of the wage item, or to 0.47 percent of the value of the product.

Laboratory, development, and advertising expenses are closely interrelated in the cement industry. A portion of the laboratory expense is for the control of manufacturing processes. The balance is for adver-

tising and for developing improved products in the individual plant or in cooperative laboratories. In answer to questionnaires of the United States Tariff Commission sent out in October 1930, 122 cement plants gave their selling expenses in addition to salesmen's salaries, expenses, and commission as less than 5 percent of the value of the product.⁶ Records of State highway departments on laboratory costs indicate that 18.8 percent goes to labor. Using the labor charge shown in table 7, the resulting charge for laboratory work becomes 4.74 percent, and the advertising and development charge is approximately 24 percent of the total for laboratory work.

	<i>Percentage of sale price</i>
Laboratory, exclusive of wages.....	3.85
Advertising and development.....	1.14

As transportation is treated as an industry, it is necessary to segregate transportation costs in the cement industry. Practically all materials and products involved are transported by rail, so the cost is for rail transportation. Cost data were obtained from reports of the Interstate Commerce Commission (38). For example, the freight rate on explosives in 1931 was found to be \$17.30 per ton. Table 9 shows 0.148 pound of explosives to be required per barrel of cement, and at this rate the freight item amounts to:

$\frac{\$17.30}{2,000} \times 0.148 = 0.13$ cents per barrel. Since costs for all materials used in the production of cement are costs at the cement mill, deduction of the freight item leaves the manufacturing cost of the materials. Thus, for explosives: $2.02 - 0.13 = 1.89$ cents, cost at source per barrel of cement.

As the subdivisions of the general items of expense attached to cement production have all been considered, the balance (7.7 percent) can be taken as the margin between the manufacturing cost and the selling price. The assembled items may be reclassified under four main heads: Salaries and wages, equipment, materials, and other expense. In this final form they constitute break-down no. 6, shown in table 5. In this table titles indicating general industries are applied. Thus cement rock or limestone and clay became "aggregates, quarrying", and gypsum was classed as "metallic-ore mining."

⁶ Prepared from unaudited statements received from such cement manufacturing companies (122 plants) as submitted to Price, Waterhouse & Co., replies to questionnaires of U. S. Tariff Commission dated October 1930.

ANALYSIS OF PAYMENTS TO OTHER INDUSTRIES

The average operating expense of each of the several industries was analyzed in a manner similar to that used for the cement industry; and the item costs are shown as percentages of the total cost, using similar subdivisions. Some of the industries, such as that analyzed in break-down no. 3 (plant and equipment expenditure for depreciation and repair and replacement) required special treatment. Examination of the financial reports of a large number of industrial establishments (11) indicated charges for land, buildings, and machinery, as follows:

	<i>Percent</i>
Land.....	9
Buildings.....	23
Machinery.....	68
	<hr/> 100

Land charges are shown as interest and rentals and are included in the "margin" item of the "other expense" division. Building charges were obtained from a break-down of the census class of commercial building construction (23, 35), and machinery charges were obtained from a break-down of the expenses involved in the manufacture of industrial equipment. The industry shown as plant and equipment is thus a weighted composite of two industries and marginal items. All items of depreciation and repair and replacement were assigned to this industry (break-down no. 3).

The iron and steel industry (break-down no. 7) includes both the blast-furnace industry and the steel manufacturing industry, since many establishments are engaged in both operations.

Likewise, the coal and coke industry (break-down no. 9) includes the production and distribution of coal and the closely allied coke industry.

Forestry products industry (break-down no. 12) includes both the logging industry and the lumber-milling and pulpwood industry. The materials purchased by the latter industry are the products of the former. Combination of these activities simplified the procedure without appreciable effect upon the accuracy of the analysis.

In the petroleum refining industry the basic material is crude oil. Practically all crude oil moves directly to the refinery. In analyzing the petroleum-products industry (break-down no. 8) the production of crude oil and refining have been combined.

In the production of explosives, petroleum products, and iron and steel, chemicals are a minor expense. Chemicals are the products of both nonferrous-metals refining (industry break-down no. 20) and nonmetallic mining or quarrying (industry break-down no. 4). The materials of the nonferrous-metals refining industry are the products of metallic-ore mining (industry break-down no. 11). Some of the latter move directly into other industries, necessitating a separation of the mining and refining industries. The general industry groups are maintained to cover the assignment of these materials or products, none of which occur in amounts of sufficient value to justify the addition of a new industry.

Expenditures of the pipe industry (break-down no. 19) are composed of relatively small amounts for labor and equipment and large amounts for materials.

Expenditures of the advertising and development industry (break-down no. 13) are assumed to be represented by a distribution of expense in the printing and publishing industry rationalized to include some measure of exploratory work.

Laboratory expense consists of costs of a structure, frequently a portion of a factory, high-grade equipment, together with the expense of personnel and testing materials for experimental work. Thus a combination of the distribution for the plant and equipment industry, already made, and a distribution of the expense involved in the manufacture of precision instruments, suffice to provide the laboratory industry (break-down no. 15).

The items "Insurance" and "Taxes" are combined. They include insurance and taxes on equipment and buildings, contract bond premium, compensation and liability insurance, and income taxes. The collective treatment is justified since a large portion of the reserves of insurance companies are invested in bonds and other obligations of Federal, State, and municipal governments. The expense of insurance-company administration of premiums and other revenues is analogous to that of a nonprofit administrative enterprise, the expense of which is confined to salaries and wages, and plant and equipment.

In the distribution of governmental disbursements no specific information is available, but investigation disclosed general data which should serve the purpose

of this analysis. About 65 percent of the governmental revenue is expended for salaries and wages in the administration of various governmental services. It should be sufficiently accurate to assume that administrative salaries and wages together with the first increment of direct labor, expressed as a percentage of disbursements, closely approximates the direct labor percentage of the general construction expenditure, or 32 percent.

Table 11 shows the approximate disbursement of all governmental revenue on a weighted basis according to the relative revenue and disbursement of the Federal, State, and local administrative units (14, 16, 28). The data of this table are the basis for analysis of the insurance and taxes industry (break-down no. 5).

TABLE 11.—*Distribution of governmental disbursements*

Disbursement item	Distribution to—			
	Salaries and wages	Plant and equipment	Interest	Total
	Percent	Percent	Percent	Percent
General departments.....	37.2	20.3	-----	57.5
Outlays, highway and other.....	9.3	19.7	-----	29.0
Public service enterprise.....	.5	-----	-----	.5
Debt service.....	-----	-----	13.0	13.0
Total.....	47.0	40.0	13.0	100.0

Fairly definite and reliable data substantiate the remaining break-downs for industries such as power, rubber, brick, and agricultural products, which constitute only a small percentage of the original expenditure. The procedure in each break-down was analogous to that already outlined and the sources of information are given in the appended bibliography.

In the later distribution of consumer expenditures, which are small income expended for the cost of living, the whole field of retail trade is assumed to receive such expenditures. The materials of retail trade are the products of wholesale trade. In turn, the materials of wholesale trade are basic materials of nature or are the products of manufacture and semimanufacture. The materials of manufacturing are, in turn, basic or products of semimanufacture, and the latter are absorbed into the manufacturing break-down.

The general data and some of the specific data necessary to break-down retail trade, wholesale trade, and manufacturing (24, 25) were obtained from reports resulting from the Fifteenth Census of the United States. These data were augmented by sources listed in the bibliography.

Retail trade (break-down no. 22), wholesale trade (break-down no. 23), and manufacturing (break-down no. 24) are the industries added to enable the distribution of consumer expenditures. They complete the list of industry break-downs needed to resume the analysis by means of the progressive distributions of highway expenditures to industries.

PROGRESSIVE DISTRIBUTION OF HIGHWAY-CONSTRUCTION EXPENDITURES

Break-downs for all the industries affected in substantial amounts have been made and further analysis involves distributing the items of the orig-

inal highway expenditure by means of these break-downs. Table 12 shows the method by which this is accomplished.

TABLE 12.—Expenditure of \$100,000,000 for highways traced progressively through various industries until it ultimately reaches salaries and wages, interest, and margin

BREAK-DOWN NO. 1—HIGHWAY CONSTRUCTION

[Figures in parentheses at heads of columns are percentages, from table 5, applied in making distributions]

Progres- sive distrib- ution no.	Distribution of expenditure for highway construction			Distribution to—												
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, transporta- tion	No. 3, plant and equipment	No. 4, aggregate, quarrying	No. 5, insurance and taxes	No. 6, cement	No. 7, iron and steel	No. 8, petroleum products	No. 12, forestry products	No. 17, brick	No. 19, pipe
1	Original expenditure	\$100,000,000	\$100,000,000	\$24,391,000	\$1,385,400	\$3,012,100	\$17,544,100	\$14,217,100	\$11,220,300	\$3,133,100	\$14,332,600	\$4,811,700	\$4,592,600	\$534,600	\$97,900	\$727,500
	Total		100,000,000		28,788,500											

BREAK-DOWN NO. 2.—TRANSPORTATION

Pro- gressive distrib- ution no.	Expenditure for transportation by other industries			Distribution to—															
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 4, aggre- gate, quarry- ing	No. 5, insurance and taxes	No. 6, ce- ment	No. 7, iron and steel	No. 8, petro- leum prod- ucts	No. 9, coal and coke	No. 10, power	No. 12, forestry products	No. 13, advertis- ing and develop- ment	No. 15, labora- tory	No. 17, brick	No. 20, nonfer- rous metals refining	
2	Highway construction.....	\$17,544,100	\$17,544,100	(51.76)	(4.16)	(14.37)	(0.37)	(9.14)	(0.18)	(10.58)	(0.42)	(3.12)	(0.39)	(1.65)	(2.17)	(1.09)	\$191,200	\$38,600	\$66,700
	Aggregate, quarrying.....	1,649,700																	
	Cement.....	1,925,800																	
	Iron and steel.....	65,200																	
3	Pipe.....	65,200	4,667,300	2,415,800	194,200	670,700	17,300	426,600	8,400	493,800	19,600	145,900	18,200	77,000	101,300	50,900	10,200	17,700	
	Forestry products.....	45,400																	
	Brick.....	6,600																	
	Insurance and taxes.....	244,400																	
	Plant and equipment.....	514,700																	
	Petroleum products.....	755,500																	
	Aggregate, quarrying.....	58,100																	
	Cement.....	25,600																	
	Iron and steel.....	770,000																	
	Forestry products.....	61,500																	
	Brick.....	18,400																	
	Nonferrous-metals refining.....	54,900																	
	Metallic-ore mining.....	72,000																	
	Container.....	10,000																	
4	Explosives.....	225,500	2,213,100	1,145,500	92,000	318,000	8,200	202,300	4,000	234,200	9,300	69,100	8,600	36,500	48,000	24,100	4,900	8,400	
	Laboratory.....	292,800																	
	Insurance and taxes.....	58,000																	
	Advertising and development.....	45,700																	
	Rubber.....	31,200																	
	Plant and equipment.....	248,800																	
	Petroleum products.....	170,700																	
	Coal and coke.....	18,500																	
	Power.....	51,400																	
	Aggregate, quarrying.....	16,100																	
	Cement.....	11,600																	
	Iron and steel.....	305,600																	
	Forestry products.....	35,500																	
	Brick.....	8,300																	
	Nonferrous-metals refining.....	42,000																	
	Metallic-ore mining.....	87,200																	
	Container.....	2,600																	
5	Explosives.....	43,000	929,600	481,100	38,700	133,600	3,400	85,000	1,700	98,300	3,900	29,000	3,600	15,400	20,200	10,100	2,100	3,500	
	Insurance and taxes.....	115,500																	
	Laboratory.....	11,500																	
	Advertising and development.....	16,800																	
	Rubber.....	15,100																	
	Agricultural products.....	11,100																	
	Plant and equipment.....	137,800																	
	Petroleum products.....	49,300																	
	Coal and coke.....	6,600																	
	Power.....	14,000																	

ANALYSIS OF HIGHWAY-CONSTRUCTION EXPENDITURES

TABLE 12.—Expenditure of \$100,000,000 for highways traced progressively through various industries until it ultimately reaches salaries and wages, interest, and margin—Contd.

BREAK-DOWN NO. 2—TRANSPORTATION—Continued																																		
[Figures in parentheses at heads of columns are percentages, from table 5, applied in making distributions]																																		
Expenditures for transportation by other industries			Distribution to—																															
Pro- gres- sive distrib- ution no.	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 4, aggre- gate, quarry- ing	No. 5, insur- ance and taxes	No. 6, ce- ment	No. 7, iron and steel	No. 8, petro- leum prod- ucts	No. 9, coal and coke	No. 10, power	No. 12, forestry products	No. 13, advertis- ing and develop- ment	No. 15, labora- tory	No. 17, brick	No. 20, nonfer- rous- metals refining																
6	Aggregate, quarrying.....	5,100	\$436,500	\$226,000	\$18,200	\$62,700	\$1,600	\$39,900	\$800	\$46,200	\$1,800	\$13,600	\$1,700	\$7,200	\$9,500	\$4,800	\$900	\$1,600																
	Cement.....	6,300																																
	Iron and steel.....	147,500																																
	Forestry products.....	16,800																																
	Brick.....	4,600																																
	Nonferrous-metals refining.....	16,900																																
	Metallic-ore mining.....	44,700																																
	Container.....	600																																
	Explosives.....	25,200																																
	Insurance and taxes.....	51,400																																
	Laboratory.....	5,100																																
	Advertising and development.....	7,800																																
7	Rubber.....	8,300	271,200	140,400	11,300	38,900																												
	Agricultural products.....	5,200																																
	Plant and equipment.....	56,200																																
	Petroleum products.....	24,700																																
	Coal and coke.....	2,800																																
	Power.....	7,300																																
	Accruals from distribution 6.....	190,600																																
	Total.....	180,600																																

BREAK-DOWN NO. 3—PLANT AND EQUIPMENT																			
Expenditure for plant and equipment by other industries			Distribution to—																
Pro- gres- sive distrib- ution no.	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, trans- porta- tion	No. 4, aggre- gate, quarry- ing	No. 5, insur- ance and taxes	No. 6, cement	No. 7, iron and steel	No. 8, petro- leum prod- ucts	No. 9, coal and coke	No. 10, power	No. 12, forestry products	No. 13, advertis- ing and develop- ment	No. 15, labora- tory	No. 16, rubber	No. 20, nonfer- rous- metals refining
2	Highway construction.....	\$14,217,100	\$14,217,100	\$5,730,900	(40.31)			\$113,700	\$594,300	\$190,500	\$1,812,700	\$92,400	\$35,500	\$91,000	\$435,000	\$270,100	\$132,200	\$732,200	\$227,500
	Petroleum products.....	1,065,500																	
	Aggregate, quarrying.....	1,968,000																	
3	Cement.....	2,250,200	6,873,200	2,770,600	325,100	1,130,000	248,800	55,000	287,300	92,100	876,300	44,700	17,200	44,000	210,300	130,600	63,900	353,900	110,000
	Iron and steel.....	460,500																	
	Pipe.....	53,500																	
	Forestry products.....	57,000																	
	Brick.....	9,700																	
	Insurance and taxes.....	1,008,800																	

TABLE 12.—Expenditure of \$100,000,000 for highways traced progressively through various industries until it ultimately reaches salaries and wages, interest, and margin—Contd.

BREAK-DOWN NO. 4—AGGREGATE, QUARRYING

[Figures in parentheses at heads of columns are percentages, from table 5, applied in making distributions]

Expenditure for aggregate, quarrying by other industries			Distribution to—												
Progres- sive dis- tribution no.	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, trans- portation	No. 3, plant and equip- ment	No. 5, in- surance and taxes	No. 8, pe- troleum products	No. 9, coal and coke	No. 10, power	No. 13, ad- vertising and de- velopment	No. 14, ex- plosives	No. 15, lab- oratory
2	Highway construction.....	\$11,220,300	\$11,220,300	(41.74)	(2.43)	(5.38)	(4.10)	(17.54)	(4.02)	(2.78)	(0.75)	(4.81)	(2.84)	(12.53)	(1.08)
	Cement.....	1,132,300		\$4,683,400	\$272,600	\$603,600	\$460,000	\$1,968,000	\$451,100	\$311,900	\$84,200	\$539,700	\$318,700	\$1,405,900	\$121,200
3	Iron and steel.....	71,700													
	Plant and equipment.....	113,700	1,418,000	591,900	34,500	76,300	58,100	248,700	57,000	39,400	10,600	68,200	40,300	177,700	15,300
	Petroleum products.....	35,400													
	Transportation.....	64,900													
	Cement.....	17,500													
	Iron and steel.....	59,600													
	Explosives.....	175,900													
4	Laboratory.....	39,800	391,400	163,400	9,500	21,100	16,100	68,700	15,700	10,900	2,900	18,800	11,100	49,000	4,200
	Rubber.....	18,300													
	Plant and equipment.....	55,000													
	Petroleum products.....	8,000													
	Transportation.....	17,300													
	Cement.....	8,000													
	Iron and steel.....	23,700													
	Explosives.....	33,500													
5	Laboratory.....	7,900	122,900	51,300	3,000	6,600	5,100	21,600	4,900	3,400	900	5,900	3,500	15,400	1,300
	Rubber.....	8,800													
	Plant and equipment.....	30,500													
	Petroleum products.....	2,300													
	Transportation.....	8,200													
	Cement.....	4,400													
	Iron and steel.....	11,400													
	Explosives.....	19,600													
6	Laboratory.....	3,500	60,800	25,400	1,500	3,300	2,500	10,700	2,400	1,700	400	2,900	1,700	7,600	700
	Rubber.....	4,900													
	Plant and equipment.....	12,400													
	Petroleum products.....	1,200													
	Transportation.....	3,400													
	Accruals from distribution 6.....	26,900	54,200	22,600	1,400	2,900									
7	Total.....	13,267,600		5,538,000	322,500	713,800									
				6,574,300											

¹ Calculated value of business transacted in subsequent distributions. Details of derivation not shown.

BREAK-DOWN NO. 5—INSURANCE AND TAXES

Pro- gressive dis- tri- bu- tion no.	Expenditure for insurance and taxes by other industries			Pro- gressive dis- tri- bu- tion no.	No. 3, plant and equip- ment	No. 2, trans- porta- tion	Interest	Salaries and wages	Expenditure for insurance and taxes by other industries			No. 3, plant and equip- ment	No. 2, trans- porta- tion	Interest	Salaries and wages
	Source	Amount	Total						Source	Amount	Total				
2	Highway construction	\$3,133,100	\$3,133,100					(47.00)	Transportation	\$202,300				(13.00)	(17.00)
	Plant and equipment	594,300						\$1,472,600	Aggregate, quarrying	15,700					
	Petroleum products	222,800							Cement	4,900					
	Transportation	1,603,500							Agricultural products	31,200					
	Aggregate, quarrying	451,100							Iron and steel	39,100					
	Cement	695,100							Forestry products	22,500					
	Iron and steel	118,400							Brick	5,600					
	Pipe	25,500							Nonferrous-metals refining	3,700					
	Forestry products	28,700							Metallic-ore mining	28,800					
	Brick	4,400							Container	1,800					
	Laboratory	40,300							Explosives	19,300					
	Advertising and development	51,600							Laboratory	3,500					
	Rubber	15,700							Advertising and development	8,800					
	Plant and equipment	287,300							Rubber	4,200					
	Petroleum products	52,600							Agricultural products	14,700					
	Coal and coke	83,300							Plant and equipment	65,000					
	Power	168,600							Petroleum products	7,600					
	Transportation	426,600							Coal and coke	12,500					
	Aggregate, quarrying	57,000							Power	23,900					
	Cement	10,800							Transportation	85,000					
	Iron and steel	98,500							Aggregate, quarrying	2,700					
	Forestry products	33,000							Cement	18,900					
	Brick	12,300							Iron and steel	10,600					
	Nonferrous-metals refining	4,900							Forestry products	3,100					
	Metallic-ore mining	23,700							Brick	1,500					
	Container	7,100							Nonferrous-metals refining	14,700					
	Explosives	101,200							Container	400					
	Laboratory	8,000							Explosives	11,300					
	Advertising and development	19,000							Accruals from distribution 6	135,300					
	Rubber	7,600							Total	190,200					
	Plant and equipment	159,000													
	Petroleum products	15,200													
	Coal and coke	29,800													
	Power	46,000													
	Total		659,500												
4	Transportation	19,800							Transportation	293,300					
	Aggregate, quarrying	10,800							Aggregate, quarrying	85,000					
	Iron and steel	33,000							Cement	2,700					
	Forestry products	12,300							Iron and steel	18,900					
	Brick	4,900							Forestry products	10,600					
	Nonferrous-metals refining	23,700							Brick	3,100					
	Metallic-ore mining	7,100							Nonferrous-metals refining	1,500					
	Container	101,200							Metallic-ore mining	14,700					
	Explosives	8,000							Container	400					
	Laboratory	19,000							Explosives	11,300					
	Advertising and development	7,600							Accruals from distribution 6	135,300					
	Rubber	159,000							Total	190,200					
	Plant and equipment	15,200													
	Petroleum products	29,800													
	Coal and coke	46,000													
	Total		659,500												
5	Transportation	19,800							Transportation	293,300					
	Aggregate, quarrying	10,800							Aggregate, quarrying	85,000					
	Iron and steel	33,000							Cement	2,700					
	Forestry products	12,300							Iron and steel	18,900					
	Brick	4,900							Forestry products	10,600					
	Nonferrous-metals refining	23,700							Brick	3,100					
	Metallic-ore mining	7,100							Nonferrous-metals refining	1,500					
	Container	101,200							Metallic-ore mining	14,700					
	Explosives	8,000							Container	400					
	Laboratory	19,000							Explosives	11,300					
	Advertising and development	7,600							Accruals from distribution 6	135,300					
	Rubber	159,000							Total	190,200					
	Plant and equipment	15,200													
	Petroleum products	29,800													
	Coal and coke	46,000													
	Total		659,500												
6	Transportation	19,800							Transportation	293,300					
	Aggregate, quarrying	10,800							Aggregate, quarrying	85,000					
	Iron and steel	33,000							Cement	2,700					
	Forestry products	12,300							Iron and steel	18,900					
	Brick	4,900							Forestry products	10,600					
	Nonferrous-metals refining	23,700							Brick	3,100					
	Metallic-ore mining	7,100							Nonferrous-metals refining	1,500					
	Container	101,200							Metallic-ore mining	14,700					
	Explosives	8,000							Container	400					
	Laboratory	19,000							Explosives	11,300					
	Advertising and development	7,600							Accruals from distribution 6	135,300					
	Rubber	159,000							Total	190,200					
	Plant and equipment	15,200													
	Petroleum products	29,800													
	Coal and coke	46,000													
	Total		659,500												
7	Transportation	19,800							Transportation	293,300					
	Aggregate, quarrying	10,800							Aggregate, quarrying	85,000					
	Iron and steel	33,000							Cement	2,700					
	Forestry products	12,300							Iron and steel	18,900					
	Brick	4,900							Forestry products	10,600					
	Nonferrous-metals refining	23,700							Brick	3,100					
	Metallic-ore mining	7,100							Nonferrous-metals refining	1,500					
	Container	101,200							Metallic-ore mining	14,700					
	Explosives	8,000							Container	400					
	Laboratory	19,000							Explosives	11,300					
	Advertising and development	7,600							Accruals from distribution 6	135,300					
	Rubber	159,000							Total	190,200					
	Plant and equipment	15,200													
	Petroleum products	29,800													
	Coal and coke	46,000													
	Total		659,500												

BREAK-DOWN NO. 6—CEMENT

Progres- sive dis- tribution no.	Expenditures for cement by other industries			Distribution to --													
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, transporta- tion	No. 3, plant and equipment	No. 4, aggregate, quarrying	No. 5, insurance and taxes	No. 8, petroleum products	No. 9, coal and coke	No. 10, power	No. 13, ad- vertising and devel- opment	No. 14, explosives	No. 15, labora- tory	No. 21, con- tainer
				(24.94)	(5.94)	(7.70)	(11.51)	(15.70)	(7.90)	(4.85)	(3.44)	(4.99)	(5.79)	(1.14)	(1.38)	(3.85)	(0.87)
2	Highway construction	\$14,332,600	\$14,332,600	\$3,574,500	\$851,400	\$1,103,600	\$1,649,700	\$2,250,200	\$1,132,300	\$695,100	\$493,000	\$715,200	\$829,900	\$163,400	\$197,800	\$551,800	\$124,700
3	{ Plant and equipment	{ 190,500	{ 222,100	{ 55,400	{ 13,200	{ 17,100	{ 25,600	{ 34,900	{ 17,500	{ 10,800	{ 7,600	{ 11,100	{ 12,900	{ 2,500	{ 3,100	{ 8,500	{ 1,900
4	{ Plant and equipment	{ 92,100	{ 100,500	{ 25,000	{ 6,000	{ 7,700	{ 11,600	{ 15,700	{ 8,000	{ 4,900	{ 3,400	{ 5,000	{ 5,800	{ 1,200	{ 1,400	{ 3,900	{ 900
5	{ Plant and equipment	{ 51,000	{ 55,000	{ 13,700	{ 3,300	{ 4,200	{ 6,300	{ 8,600	{ 4,400	{ 2,700	{ 1,900	{ 2,700	{ 3,300	{ 600	{ 800	{ 2,100	{ 400
6	{ Plant and equipment	{ 20,800	{ 22,500	{ 5,600	{ 1,300	{ 1,700	{ 2,600	{ 3,500	{ 1,800	{ 1,100	{ 800	{ 1,100	{ 1,300	{ 300	{ 300	{ 900	{ 200
7	{ Plant and equipment	{ 1,700	{ 27,200	{ 6,800	{ 1,600	{ 2,100											
	{ Accruals from distribution 6	{ 116,700															
	Total		14,759,900	{ 3,681,000	876,800	1,136,400											
					5,694,200												

TABLE 12.—*Expenditure of \$100,000,000 for highways traced progressively through various industries until it ultimately reaches salaries and wages, interest, and margin—Contd.*

BREAK-DOWN NO. 7—IRON AND STEEL

[Figures in parentheses at heads of columns are percentages, from table 5, applied in making distributions]

Progressive distribution no.	Expenditure for iron and steel by other industries			Distribution to—													
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, transportation	No. 3, plant and equipment	No. 4, aggregate, quarrying	No. 5, insurance and taxes	No. 8, petroleum products	No. 9, coal and coke	No. 10, power	No. 11, metallic ore mining	No. 13, advertising and development	No. 15, laboratory	No. 20, nonferrous metals refining
2	Highway construction.....	\$4,811,700	\$4,811,700	\$1,090,800	\$127,500	\$320,900	\$925,800	\$460,500	\$71,700	\$118,400	\$50,500	\$431,600	\$40,900	\$858,900	\$52,000	\$48,100	\$214,100
3	Pipe.....	333,100															
3	Plant and equipment.....	1,812,700	4,002,000	907,200	106,100	266,900	770,000	383,000	59,600	98,500	42,000	359,000	34,000	714,400	43,200	40,000	178,100
		Transportation.....															
4	Container.....	62,000	1,588,400	360,100	42,100	105,900	305,600	152,000	23,700	39,100	16,700	142,500	13,500	283,500	17,100	15,900	70,700
	Laboratory.....	156,300															
	Plant and equipment.....	876,300															
	Transportation.....	493,800															
	Container.....	16,100															
5	Laboratory.....	31,100	766,600	173,800	20,300	51,100	147,500	73,400	11,400	18,900	8,000	68,800	6,500	136,800	8,300	7,700	34,100
	Plant and equipment.....	485,200															
	Transportation.....	234,200															
	Container.....	3,800															
	Laboratory.....	13,700															
6	Plant and equipment.....	198,200	314,000	71,200	8,300	20,900	60,400	30,100	4,700	7,700	3,300	28,200	2,700	56,000	3,400	3,100	14,000
	Transportation.....	98,300															
	Accruals from distribution 6.....	146,800															
7	Total.....	11,941,600	{ 2,707,100	316,500	796,300	3,819,900											

1 Calculated value of business transacted in subsequent distributions. Details of derivation not shown.

BREAK-DOWN NO. 8-PETROLEUM PRODUCTS

Expenditure for petroleum products by other industries		Distribution to—																			
Progres- sive dis- tribution no.	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, transporta- tion	No. 3, plant and equipment	No. 4, aggregate, quarrying	No. 5, insurance and taxes	No. 9, coal and coke	No. 10, power	No. 13, advertising and devel- opment	No. 15, laboratory	No. 21, container						
2	Highway construction.....	\$4,592,600	\$4,592,600	(29.80)	(5.48)	(13.06)	(16.45)	(23.20)	(0.77)	(5.07)	(0.13)	(0.28)	(1.88)	(1.78)	(2.10)						
	Plant and equipment.....	92,400		\$1,368,600	\$251,700	\$599,800	\$755,500	\$1,065,500	\$35,400	\$232,800	\$6,000	\$12,900	\$86,300	\$81,700	\$96,400						
3	Transportation.....	73,700	1,037,900	309,300	56,800	135,600	170,700	240,800	8,000	52,600	1,400	2,900	19,500	18,500	21,800						
	Aggregate, quarrying.....	311,900																			
4	Cement.....	493,000	299,500	89,300	16,400	39,100	49,300	69,500	2,300	15,200	400	800	5,600	5,300	6,300						
	Iron and steel.....	50,500																			
	Pipe.....	3,200																			
	Forestry products.....	7,400																			
	Brick.....	3,800																			
	Coal and coke.....	18,300																			
	Power.....	35,300																			
	Transportation.....	19,600																			
	Aggregate, quarrying.....	39,400																			
	Cement.....	7,600																			
	Iron and steel.....	42,000																			
	Forestry products.....	10,000																			
	Brick.....	10,500																			
	Nonferrous-metals refining.....	5,600																			
	Metallic-ore mining.....	25,900																			
	Container.....	400																			
	Explosives.....	18,900																			
	Laboratory.....	3,600																			
	Advertising and development.....	17,300																			
	5	Rubber.....														4,400	150,400	44,800	8,200	19,700	24,700
Plant and equipment.....		44,700																			
Coal and coke.....		6,600																			
Power.....		9,600																			
Transportation.....		9,300																			
Aggregate, quarrying.....		10,900																			
Cement.....		3,500																			
Iron and steel.....		16,700																			
Forestry products.....		5,800																			
Brick.....		4,700																			
Nonferrous-metals refining.....		4,300																			
Metallic-ore mining.....		31,300																			
Container.....		3,600																			
Explosives.....		700																			
Laboratory.....		6,400																			
Advertising and development.....		12,000																			
Agricultural products.....		24,700																			
Plant and equipment.....		200																			
Rubber.....		2,800																			
Coal and coke.....		2,800																			
6	Power.....	5,000	69,400	20,750	3,800	9,100	11,400	16,100	500	3,500	100	200	1,300	1,200	1,500						
	Transportation.....	3,900																			
	Aggregate, quarrying.....	3,400																			
	Cement.....	1,900																			
	Iron and steel.....	8,000																			
	Forestry products.....	2,800																			
	Brick.....	2,600																			
	Nonferrous-metals refining.....	1,800																			
	Metallic-ore mining.....	16,100																			
	Explosives.....	2,100																			
	Laboratory.....	2,300																			
	Advertising and development.....	2,900																			
	Rubber.....	100																			
	Agricultural products.....	5,600																			
	Plant and equipment.....	10,100																			
	Accruals from distribution 6.....	31,600																			
	7	Total.....														1,833,600	6,215,000	1,852,200	340,500	811,800	3,004,500

Calculated value of business transacted in subsequent distributions. Details of derivation not shown.

ANALYSIS OF HIGHWAY-CONSTRUCTION EXPENDITURES

TABLE 12.—Expenditure of \$100,000,000 for highways traced progressively through various industries until it ultimately reaches salaries and wages, interest, and margin—Contd.

BREAK-DOWN NO. 9—COAL AND COKE

[Figures in parentheses at heads of columns are percentages, from table 5, applied in making distributions]

Progressive distribution no.	Expenditure for coal and coke by other industries		Distribution to—										
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, trans- portation	No. 3, plant and equipment	No. 5, insurance and taxes	No. 8, petroleum products	No. 10, power	No. 13, advertis- ing and develop- ment	No. 14, explosives
3	Transportation.....	\$547,400	\$1,831,200	(61.42)	(5.13)	(6.10)	(1.01)	(16.16)	(4.55)	(1.00)	(2.57)	(0.59)	\$26,900
	Aggregate, quarrying.....	84,200											
	Cement.....	715,200											
	Iron and steel.....	431,600											
	Forestry products.....	8,100											
	Brick.....	3,200											
	Plant and equipment.....	35,500											
	Petroleum products.....	6,000											
	Power.....	48,900											
	Transportation.....	145,600											
4	Aggregate, quarrying.....	10,600	654,600	402,100	33,500	39,900	6,600	105,800	29,800	6,600	16,800	3,900	9,600
	Cement.....	11,100											
	Iron and steel.....	339,000											
	Forestry products.....	11,000											
	Brick.....	9,000											
	Plant and equipment.....	4,500											
	Petroleum products.....	8,800											
	Power.....	15,200											
	Nonferrous-metals refining.....	1,800											
	Metallic-ore mining.....	1,800											
5	Container.....	8,200	274,600	168,600	14,100	16,800	2,800	44,300	12,500	2,800	7,100	1,600	4,000
	Laboratory.....	2,000											
	Advertising and development.....	17,200											
	Rubber.....	1,400											
	Plant and equipment.....	13,300											
	Petroleum products.....	69,100											
	Power.....	2,900											
	Transportation.....	5,000											
	Aggregate, quarrying.....	142,500											
	Cement.....	6,300											
6	Forestry products.....	4,100	128,400	78,800	6,600	7,800	1,300	20,700	5,900	1,300	3,300	800	1,900
	Brick.....	3,400											
	Nonferrous-metals refining.....	10,700											
	Metallic-ore mining.....	2,900											
	Container.....	2,400											
	Explosives.....	3,000											
	Laboratory.....	1,000											
	Advertising and development.....	9,500											
	Rubber.....	7,000											
	Plant and equipment.....	29,000											
7	Petroleum products.....	7,000	76,200	46,800	3,900	4,700	1,300	2,154,000	180,900	2,965,000	152,100	1,821,000	2,154,000
	Power.....	2,700											
	Transportation.....	68,800											
	Aggregate, quarrying.....	3,000											
	Cement.....	2,200											
	Iron and steel.....	1,400											
	Forestry products.....	5,500											
	Brick.....	1,700											
	Nonferrous-metals refining.....	1,200											
	Metallic-ore mining.....	1,400											

PROGRESSIVE DISTRIBUTION OF HIGHWAY-CONSTRUCTION EXPENDITURES

BREAK-DOWN NO. 10-POWER

Progres- sive dis- tribution no.	Expenditure for power by other industries		Distribution to—									
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, transpor- tation	No. 3, plant and equip- ment	No. 5, in- surance and taxes	No. 8, pe- troleum products	No. 9, coal and coke	No. 13, ad- vertising and devel- opment
3	Transportation.....	\$68,400	\$1,619,500	(21.65)	(15.88)	(27.95)	(3.18)	(13.14)	(10.41)	(2.18)	(3.02)	(2.59)
	Aggregate, quarrying.....	539,700										
	Cement.....	829,900										
	Iron and steel.....	40,900										
	Pipe.....	9,400										
	Forestry products.....	23,900										
	Brick.....	3,400										
	Plant and equipment.....	91,000										
	Petroleum products.....	12,900										
	Transportation.....	18,200										
	Aggregate, quarrying.....	68,200										
	Cement.....	12,900										
	Iron and steel.....	34,000										
4	Forestry products.....	32,400	441,800	95,700	70,100	123,500	14,000	58,100	46,000	9,600	13,300	11,500
	Brick.....	9,400										
	Nonferrous-metals refining.....	4,100										
	Metallic-ore mining.....	56,600										
	Container.....	1,800										
	Explosives.....	22,500										
	Laboratory.....	5,800										
	Advertising and development.....	76,700										
	Rubber.....	5,200										
	Plant and equipment.....	44,000										
	Petroleum products.....	2,900										
	Coal and coke.....	47,100										
	Transportation.....	8,600										
5	Aggregate, quarrying.....	18,800	230,000	49,800	36,500	64,300	7,300	30,200	23,900	5,000	7,000	6,000
	Cement.....	5,800										
	Iron and steel.....	13,500										
	Forestry products.....	18,700										
	Brick.....	4,300										
	Nonferrous-metals refining.....	3,200										
	Metallic-ore mining.....	68,600										
	Container.....	500										
	Explosives.....	4,300										
	Laboratory.....	1,200										
	Advertising and development.....	28,200										
	Rubber.....	2,500										
	Agricultural products.....	9,800										
6	Plant and equipment.....	24,400	106,500	23,000	16,900	29,800	3,400	14,000	11,100	2,300	3,300	2,700
	Petroleum products.....	800										
	Coal and coke.....	16,800										
	Transportation.....	3,600										
	Aggregate, quarrying.....	5,900										
	Cement.....	3,300										
	Iron and steel.....	6,500										
	Forestry products.....	8,800										
	Brick.....	2,300										
	Nonferrous-metals refining.....	1,300										
	Metallic-ore mining.....	35,200										
	Container.....	2,500										
	Explosives.....	500										
7	Laboratory.....	500	73,100	15,800	11,600	20,500	392,300	690,800	1,618,000	2,300	3,300	2,700
	Advertising and development.....	13,100										
	Rubber.....	1,400										
	Agricultural products.....	4,600										
	Plant and equipment.....	9,900										
	Petroleum products.....	400										
	Coal and coke.....	7,100										
	Accruals from distribution 6.....	47,900										
	Total.....	1 25,200										

Calculated value of business transacted in subsequent distributions. Details of derivation not shown.

Progressive distribution no.	Expenditure for advertising and development by other industries	Distribution to—										
		Salaries and wages	Interest	Margin	No. 2, transportation	No. 3, plant and equipment	No. 5, insurance and taxes	No. 8, petroleum and products	No. 9, coal and coke	No. 10, power	No. 12, forestry products	
3	Plant and equipment.....	\$270,100										
	Petroleum products.....	86,300										
	Transportation.....	380,700										
	Aggregate, quarrying.....	318,700										
	Cement.....	163,400										
	Iron and steel.....	52,000										
	Pipe.....	36,300										
	Forestry products.....	9,800										
	Brick.....	2,600										
	Rubber.....	8,800										
4	Plant and equipment.....	130,600										
	Petroleum products.....	19,500										
	Coal and coke.....	10,800										
	Power.....	42,000										
	Transportation.....	101,300										
	Aggregate, quarrying.....	40,300										
	Cement.....	2,500										
	Iron and steel.....	43,200										
	Forestry products.....	13,300										
	Brick.....	7,400										
5	Nonferrous-metals refining.....	4,000										
	Metallic-ore mining.....	23,400										
	Container.....	1,000										
	Explosives.....	19,700										
	Laboratory.....	17,600										
	Rubber.....	4,300										
	Plant and equipment.....	72,300										
	Petroleum products.....	5,600										
	Coal and coke.....	3,900										
	Power.....	11,500										
6	Transportation.....	48,000										
	Aggregate, quarrying.....	11,100										
	Cement.....	1,200										
	Iron and steel.....	17,100										
	Forestry products.....	7,700										
	Brick.....	3,300										
	Nonferrous-metals refining.....	3,100										
	Metallic-ore mining.....	28,300										
	Container.....	200										
	Explosives.....	3,800										
7	Laboratory.....	3,500										
	Rubber.....	2,400										
	Plant and equipment.....	29,500										
	Petroleum products.....	2,800										
	Coal and coke.....	1,600										
	Power.....	6,000										
	Transportation.....	20,200										
	Aggregate, quarrying.....	3,500										
	Cement.....	600										
	Iron and steel.....	8,300										

Calculated value of business transacted in subsequent distributions. Details of derivation not shown.

TABLE 12.—Expenditure of \$100,000,000 for highways traced progressively through various industries until it ultimately reaches salaries and wages, interest, and margin—Contd.

BREAK-DOWN NO. 17—BRICK

[Figures in parentheses at heads of columns are percentages, from table 5, applied in making distributions]

Expenditures for brick by other industries			Distribution to—											
Progres- sive dis- tribution no.	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, trans- por- tation	No. 3, plant and equipment	No. 5, in- sur- ance and taxes	No. 8, pe- tro- leum products	No. 9, coal and coke	No. 10, power	No. 13, ad- ver- siting and devel- opment	No. 15, laboratory
				(46.52)	(3.29)	(14.62)	(6.72)	(9.87)	(4.50)	(3.84)	(3.30)	(3.46)	(2.70)	(1.18)
2	Highway construction	\$97,900	\$97,900	\$45,500	\$3,200	\$14,300	\$6,600	\$9,700	\$4,400	\$3,800	\$3,200	\$3,400	\$2,600	\$1,200
3	Plant and equipment	234,600	273,200	127,100	9,000	39,900	18,400	27,000	12,300	10,500	9,000	9,400	7,400	3,200
	Transportation	38,600												
4	Plant and equipment	113,400	123,600	57,500	4,100	18,100	8,300	12,200	5,600	4,700	4,100	4,300	3,300	1,400
	Transportation	10,200												
5	Plant and equipment	62,800	67,700	31,500	2,200	9,900	4,600	6,700	3,100	2,600	2,200	2,300	1,800	800
	Transportation	4,900												
6	Plant and equipment	26,600	27,700	12,900	900	4,100	1,900	2,700	1,200	1,100	900	1,000	700	300
	Transportation	2,100												
7	Accruals from distribution 6	12,900	20,000	9,300	700	2,900								
		17,100												
	Total		610,100	283,800	20,100	89,200								

BREAK-DOWN NO. 18—AGRICULTURAL PRODUCTS

Progressive distribution no.	Expenditure for agricultural products by other industries			Distribution to—							No. 10, power
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, transportation	No. 3, plant and equipment	No. 5, insurance and taxes	No. 8, petroleum products	
4	{ Container..... Rubber.....	{ \$24, 100 344, 400	{ \$368, 500	{ (24.23)	{ (13.68)	{ (11.88)	{ (3.00)	{ (32.80)	{ (8.48)	{ (3.26)	{ (2.67)
5	{ Container..... Rubber.....	{ 6, 300 166, 500	{ 172, 800	{ \$89, 300 41, 900	{ \$50, 400 23, 600	{ \$43, 800 20, 500	{ \$11, 100 5, 200	{ \$120, 900 56, 700	{ \$31, 200 14, 700	{ \$12, 000 5, 600	{ \$9, 800 4, 600
6	{ Container..... Rubber.....	{ 1, 500 92, 200	{ 93, 700	{ 22, 700 92, 200	{ 12, 800	{ 11, 100	{ 2, 800	{ 30, 700	{ 8, 000	{ 3, 100	{ 2, 500
7	{ Accruals from distribution 6.....	{ 38, 400 1 38, 800	{ 77, 200	{ 18, 700	{ 10, 500	{ 9, 200					
	Total.....	-----	712, 200	{ 172, 600 97, 300 354, 500							

BREAK-DOWN NO. 19—PIPE

Progressive distribution no.	Expenditure for pipe by other industries			Distribution to—									
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, transportation	No. 3, plant and equipment	No. 5, insurance and taxes	No. 7, iron and steel	No. 8, petroleum products	No. 10, power	No. 13, advertising and development
2	Highway construction.....	\$727,500	\$727,500	(18.58)	(2.30)	(6.52)	(8.97)	(7.35)	(3.50)	(45.78)	(0.71)	(1.30)	(4.99)
	Total.....		727,500	\$135,200	\$16,700	\$47,400	\$65,200	\$53,500	\$25,500	\$333,100	\$5,200	\$9,400	\$36,300

BREAK-DOWN NO. 20—NONFERROUS-METALS REFINING

Progressive distribution no.	Expenditure for nonferrous-metals refining by other industries			Distribution to—										
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2,trans- portation	No. 3, plant and equip- ment	No. 5, in- surance and taxes	No. 8, pe- troleum products	No. 9, coal and coke	No. 10, power	No. 11, metallic- ore mining	No. 13, advertis- and de- velopment
3	Plant and equipment..... Transportation..... Iron and steel..... Container..... Laboratory..... Plant and equipment..... Transportation..... Iron and steel..... Container..... Laboratory..... Plant and equipment..... Transportation..... Iron and steel..... Container..... Laboratory..... Plant and equipment..... Transportation..... Iron and steel..... Container..... Laboratory..... Plant and equipment..... Transportation..... Iron and steel..... Accruals from distribution 6.....	\$227,500 66,700 214,100 1,200 82,200 110,000 17,700 178,100 300 16,400 60,900 8,400 70,700 100 7,200 24,900 3,500 34,100 30,500 175,900	\$508,300 <											

BREAKDOWN NO. 21—CONTAINER

Expenditure for container by other industries			Distribution to—															
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, transportation	No. 3, plant and equip- ment	No. 5, insur- ance and taxes	No. 7, iron and steel	No. 8, petro- leum products	No. 9, coal and coke	No. 10, power	No. 12, forestry products	No. 13, advertis- ing and develop- ment	No. 18, agricul- tural products	No. 20, nonfer- rous metals refining	
3	Petroleum products.....	\$96,400	\$221,100	(21.07)	(1.83)	(6.80)	(4.53)	(6.86)	(3.22)	(28.03)	(0.18)	(0.14)	(0.83)	(14.65)	(0.43)	(10.91)	(0.52)	
	Cement.....	124,700		\$46,600	\$4,000	\$15,000	\$10,000	\$15,200	\$7,100	\$62,000	\$400	\$300	\$1,800	\$32,400	\$1,000	\$24,100	\$1,200	
	Petroleum products.....	21,800																
4	Cement.....	1,900	57,400	12,100	1,100	3,900	2,600	3,900	1,800	16,100	100	100	500	8,400	200	6,300	300	
	Explosives.....	33,700																
	Petroleum products.....	6,300																
5	Cement.....	6,900	13,600	2,900	300	900	600	900	400	3,800								
	Explosives.....	3,200																
	Petroleum products.....	3,400																
6	Cement.....	3,800	7,400	1,600	100	500	300	500	200	2,100								
	Explosives.....	3,400																
	Petroleum products.....	17,900																
7	Accruals from distribution 6.....		310,800	65,600	5,700	21,100												
	Total.....					92,400												

1 Calculated value of business transacted in subsequent distributions. Details of derivation not shown.

Progressive distribution no. 1 in table 12 repeats from table 4 the distribution of an original \$100,000,000 highway expenditure to salaries and wages, interest, margin, and various industries. In this and subsequent distributions the items salaries and wages, interest, and margin are set aside for later collection and analysis. The amounts assigned to industries in distribution no. 1 are now transferred to the corresponding industry break-downs of table 12, in preparation for distribution no. 2. For example, break-down no. 1 of table 12 shows \$14,332,600 assigned to the cement industry. This item appears in break-down no. 6, distribution no. 2. Similarly, other items of break-down no. 1 are entered under the proper industries and analyzed as distribution no. 2. The analysis is made by applying the percentages derived in table 5. A total of \$71,211,500 is distributed in this manner as distribution no. 2.

In making distribution no. 3 the procedure of distribution no. 2 is followed, except that amounts for distribution may come from one or several of the industries. For example, examining distribution no. 2 of all industries it is found that only the plant and equipment industry and the transportation industry contrib-

ute to the cement industry and in the amounts of \$190,500 and \$31,600, respectively. These amounts are entered in break-down no. 6 for the cement industry for analysis as distribution no. 3. The second column of table 12 shows, in all cases, the sources from which the amounts are derived. All new entries are from the preceding distribution. The total amount analyzed in distribution no. 3 is \$32,794,200.

These processes are repeated in progressive distributions, each distribution adding increments to salaries and wages, interest, and margin, and reducing the amount remaining for further distribution. The third distribution leaves \$14,743,600 for further analysis, the fourth \$6,583,300, the fifth \$2,979,400, and the sixth leaves only \$1,335,600. This amount is assigned to industries and then distributed to salaries and wages, interest, and margin, in the amounts accruing to the various industries from distribution no. 6. The result is shown as distribution no. 7.

Table 13 is a summary of table 12 and shows the value of business transacted by each industry and the amounts finally assigned to salaries and wages, interest, and margin as a result of the distributions.

TABLE 13.—Steps in the distribution of \$100,000,000 highway construction expenditure, without reinvestment

Break-down no.	Item	Original expenditure	Progressive distribution no.—						
			1	2	3	4	5	6	7
	Salaries and wages.....		\$24,391,000	\$51,856,600	\$64,455,000	\$70,158,400	\$72,663,700	\$73,803,900	\$74,726,000
	Interest.....		1,385,400	4,735,000	6,598,300	7,408,400	7,773,700	7,941,100	8,077,600
	Margin.....		3,012,100	10,614,200	14,203,100	15,849,900	16,583,200	16,919,400	17,196,400
1	Highway construction.....	\$100,000,000							
2	Transportation.....		17,544,100	4,667,300	2,213,100	929,600	436,500	190,600	
3	Plant and equipment.....		14,217,100	6,873,200	3,805,900	1,553,900	725,400	327,100	
4	Aggregate, quarrying.....		11,220,300	1,418,000	391,400	122,900	60,800	26,900	
5	Insurance and taxes.....		3,133,100	3,753,800	1,480,500	659,500	293,300	135,300	
6	Cement.....		14,332,600	222,100	100,500	55,000	22,500	10,500	
7	Iron and steel.....		4,811,700	4,002,000	1,588,400	766,600	314,000	146,800	
8	Petroleum products.....		4,592,600	1,037,900	299,500	150,400	69,400	31,600	
9	Coal and coke.....			1,831,200	654,600	274,600	128,400	55,400	
10	Power.....			1,619,500	441,800	230,000	106,500	47,900	
11	Metallic-ore mining.....			858,900	1,041,200	533,700	237,500	100,900	
12	Forestry products.....		534,600	724,500	418,400	197,700	81,700	38,000	
13	Advertising and development.....			1,319,900	455,400	224,900	99,900	45,400	
14	Explosives.....			1,603,700	305,800	178,900	81,100	36,900	
15	Laboratory.....			1,127,400	224,500	98,800	43,800	19,700	
16	Rubber.....			732,200	353,900	196,000	80,000	37,400	
17	Brick.....		97,900	273,200	123,600	67,700	27,700	12,900	
18	Agricultural products.....				368,500	172,800	93,700	38,400	
19	Pipe.....		727,500						
20	Nonferrous-metals refining.....			508,300	389,200	156,700	69,800	30,500	
21	Container.....			221,100	57,400	13,600	7,400	3,400	
	Total.....	100,000,000	71,211,500	32,794,200	14,743,600	6,583,300	2,979,400	1,335,600	
	Grand total.....	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000

Table 14 lists, by industries, the amounts shown in table 12 as going to salaries and wages, and to interest and margin, which were set aside for later consideration. Table 14 also shows the total value of business in each industry resulting from an expenditure on highways of \$100,000,000. This expenditure results

in payments to labor on the job, in transportation, and in the manufacture of materials and machinery of \$74,726,000. Such payments result from the investment in highways. Payments to labor resulting from reinvestment of margin and interest expenses are considered later.

TABLE 14.—*Summary from table 12 of salaries and wages, interest, margin, and value of business for each industry without reinvestment*

Break-down no.	Industry	Salaries and wages	Interest	Margin	Total	Value of business
1	Highway construction.....	\$24,391,000	\$1,385,400	\$3,012,100	\$28,788,500	\$100,000,000
2	Transportation.....	13,489,600	1,084,200	3,745,000	18,318,800	26,061,800
3	Plant and equipment.....	11,169,000	1,310,600	4,555,200	17,034,800	27,707,600
4	Aggregate, quarrying.....	5,538,000	322,500	713,800	6,574,300	13,267,600
5	Insurance and taxes.....	4,486,500	1,240,900		5,727,400	9,545,700
6	Cement.....	3,681,000	876,800	1,136,400	5,694,200	14,759,900
7	Iron and steel.....	2,707,100	316,500	796,300	3,819,900	11,941,600
8	Petroleum products.....	1,852,200	340,500	811,800	3,004,500	6,215,000
9	Coal and coke.....	1,821,000	152,100	180,900	2,154,000	2,965,000
10	Power.....	534,900	392,300	690,800	1,618,000	2,470,900
11	Metallic-ore mining.....	1,030,200	90,700	323,000	1,443,900	2,872,000
12	Forestry products.....	1,067,300	63,700	203,900	1,334,900	2,014,200
13	Advertising and development.....	831,400	129,800	177,000	1,138,200	2,218,500
14	Explosives.....	465,600	114,400	294,600	874,600	2,265,200
15	Laboratory.....	567,200	70,000	170,500	807,700	1,531,900
16	Rubber.....	314,500	31,200	84,900	430,600	1,491,500
17	Brick.....	283,800	20,100	89,200	393,100	610,100
18	Agricultural products.....	172,600	97,300	84,600	354,500	712,200
19	Pipe.....	135,200	16,700	47,400	199,300	727,500
20	Nonferrous-metals refining.....	122,300	16,200	57,900	196,400	1,330,400
21	Container.....	65,600	5,700	21,100	92,400	310,800
	Total.....	74,726,000	8,077,600	17,196,400	100,000,000	231,019,400

Of the original expenditure, \$8,077,600 accrues as interest and \$17,196,400 accrues as margin, making a total of \$25,274,000 available for reinvestment. The reinvestment is partly in the field of producer goods and partly in the field of consumer goods.

Accruals to margin are divided into payments as dividends, 59.82 percent or \$10,286,600, and payments as surplus, 40.18 percent or \$6,909,800. These proportions were determined by examination of the financial statements of establishments in the industries involved.

Interest, \$8,077,600, and dividends, \$10,286,600, are collected into a single item representing income to the recipients. Such payments are further divided into large incomes, 37.84 percent or \$6,949,800, and small incomes, 62.16 percent or \$11,414,400. This division is made on the basis of income-tax returns indicating the relative proportions of large and small incomes (46).

Large incomes—above \$10,000 per annum—are assumed to be available for reinvestment in producer goods and small incomes are assumed to be spent entirely for the cost of living. There is some error in each of these assumptions, but the errors tend to cancel each other. The division of large and small incomes about an income of \$25,000 per annum would not materially alter the assumption. Small incomes, large in number, have small balances available for

reinvestment in producer goods. Large incomes, small in number, have large balances available for reinvestment in producer goods and are expended in relatively small amounts for consumer goods. Any error in the assumption that these results are compensating should have little effect on the ultimate analysis.

Large incomes, \$6,949,800, and surplus, \$6,909,800, are collected into a single item, \$13,859,600, and assigned to the field of producer goods for reinvestment. The percentages for use in distribution to the producer-goods field have already been established and summarized in table 14. Before proceeding further with the distribution of reinvestment items, it is necessary to establish a distribution of expenditures in the field of consumer goods. For this purpose the amount assigned to small incomes, \$11,414,400, will be further analyzed.

The recipients of small incomes from investment are closely identified with the small-salary and small-wage group. The individuals comprising this class expend their income for living expenses—food, clothing, housing, amusements, and contingencies. The total expenditures by all such individuals are spread throughout the entire field of retail trade. Therefore, in this analysis, it is logical to assign consumer-goods expenditures to items composing the retail-trade industry.

DISTRIBUTION OF EXPENDITURES FOR CONSUMER GOODS

The first distribution of expenditures for consumer goods is shown in break-down no. 22 of table 15. In this distribution salaries and wages, interest, and margin items are set aside, and the remainder is assigned to other industries. The amount distributed to wholesale trade is subsequently broken down in distribution no. 2. In this distribution, salaries and wages, interest, and margin items are again set aside and manufacturing forms a considerable percentage of the remainder. Other industries are assigned amounts which are transferred and accumulated for progressive distribution by a procedure identical

with that used in the progressive distributions in table 12. Distribution of consumer-goods expenditures involve, with one exception (break-down no. 19), all industries previously involved in the distributions of table 12 and the addition of three new industries.

Table 16 is a summary of the steps in the distribution of consumer-goods expenditures. For each step, the total accumulations to salaries and wages, interest, and margin are shown together with the amounts remaining for further distribution. The final step establishes the percentage distribution of consumer expenditures.

BREAK-DOWN NO. 8—PETROLEUM PRODUCTS

Progres- sive dis- tribution no.	Expenditure for petroleum products by other industries			Distribution to—														
	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, transporta- tion	No. 3, plant and equipment	No. 4, aggregate, quarrying	No. 5, insurance and taxes	No. 9, coal and coke	No. 10, power	No. 13, advertising and devel- opment	No. 15, laboratory	No. 21, container			
2	Retail trade.....	\$24,000	\$24,000	(29.80)	(5.48)	(13.06)	(16.45)	(23.20)	(0.77)	(5.07)	(0.13)	(0.28)	(1.88)	(1.78)	(2.10)			
	Transportation.....	3,700		\$7,200	\$1,300	\$3,100	\$3,900	\$5,600	\$200	\$1,200			\$100	\$500	\$400	\$500		
	Plant and equipment.....	3,400																
	Power.....	2,600																
	Advertising and development.....	200																
	Wholesale trade.....	103,700																
	Transportation.....	1,100																
	Plant and equipment.....	3,100																
	Aggregate, quarrying.....	300																
	Cement.....	2,200																
3	Iron and steel.....	2,500	115,600															
	Coal and coke.....	2,800																
	Power.....	4,200																
	Metallic-ore mining.....	2,400																
	Forestry products.....	1,400																
	Advertising and development.....	2,100																
	Laboratory.....	400																
	Brick.....	19,300																
	Agricultural products.....	100																
	Nonferrous-metals refining.....	113,600																
4	Manufacturing.....	900	151,500															
	Transportation.....	6,400																
	Plant and equipment.....	300																
	Aggregate, quarrying.....	200																
	Cement.....	1,000																
	Iron and steel.....	1,100																
	Coal and coke.....	1,800																
	Power.....	6,100																
	Metallic-ore mining.....	1,400																
	Forestry products.....	1,000																
5	Advertising and development.....	200	43,200															
	Explosives.....	100																
	Laboratory.....	300																
	Brick.....	22,200																
	Agricultural products.....	200																
	Nonferrous-metals refining.....	700																
	Transportation.....	2,900																
	Plant and equipment.....	400																
	Aggregate, quarrying.....	500																
	Cement.....	1,600																
6	Iron and steel.....	200	11,100															
	Coal and coke.....	1,200																
	Power.....	900																
	Metallic-ore mining.....	600																
	Forestry products.....	500																
	Advertising and development.....	300																
	Explosives.....	100																
	Laboratory.....	600																
	Brick.....	400																
	Agricultural products.....	200																
7	Nonferrous-metals refining.....	400	6,000															
	Transportation.....	800																
	Plant and equipment.....	300																
	Aggregate, quarrying.....	200																
	Cement.....	800																
	Iron and steel.....	200																
	Coal and coke.....	300																
	Power.....	1,200																
	Metallic-ore mining.....	200																
	Forestry products.....	200																
8	Advertising and development.....	100	6,200															
	Explosives.....	300																
	Laboratory.....	800																
	Brick.....	200																
	Agricultural products.....	3,000																
	Nonferrous-metals refining.....	1,300																
	Accruals from distribution 7.....																	
	Total.....			357,600	106,600	19,600	46,700											
					172,900													

1 Calculated value of business created in subsequent distributions. Details of derivation not shown.

BREAK-DOWN NO. 10—POWER

Expenditure for power by other industries												
Progressive distribution no.	Source	Amount	Total	Distribution to—								
				Salaries and wages	Interest	Margin	No. 2, transportation	No. 3, plant and equipment	No. 5, insurance and taxes	No. 8, petroleum products	No. 9, coal and coke	No. 13, advertising and development
2	Retail trade.....	\$119,900	\$119,900	(21.65) \$26,000	(15.88) \$19,000	(27.95) \$33,500	(3.18) \$3,800	(13.14) \$15,800	(10.41) \$12,500	(2.18) \$2,600	(3.02) \$3,600	(2.59) \$3,100
3	Transportation.....	5,300	130,500	28,300	20,700	36,500	4,200	17,100	13,600	2,800	3,900	3,400
	Plant and equipment.....	3,400										
	Petroleum products.....	900										
	Advertising and development.....	120,800										
	Wholesale trade.....	1,100										
	Transportation.....	3,000										
	Plant and equipment.....	500										
	Aggregate, quarrying.....	500										
	Cement.....	1,800										
	Iron and steel.....	1,300										
4	Petroleum products.....	1,200	80,100	17,300	12,700	22,500	2,500	10,500	8,300	1,800	2,400	2,100
	Coal and coke.....	9,100										
	Metallic-ore mining.....	4,600										
	Forestry products.....	9,200										
	Advertising and development.....	100										
	Laboratory.....	200										
	Rubber.....	400										
	Brick.....	15,800										
	Agricultural products.....	32,200										
	Nonferrous-metals refining.....	100										
5	Manufacturing.....	6,300	53,500	11,600	8,500	14,900	1,700	7,000	5,600	1,200	1,600	1,400
	Transportation.....	400										
	Plant and equipment.....	800										
	Aggregate, quarrying.....	2,800										
	Cement.....	13,300										
	Iron and steel.....	4,600										
	Petroleum products.....	300										
	Coal and coke.....	4,300										
	Metallic-ore mining.....	100										
	Forestry products.....	200										
6	Advertising and development.....	300	15,100	3,300	2,400	4,200	500	1,900	1,600	300	500	400
	Explosives.....	100										
	Laboratory.....	200										
	Rubber.....	300										
	Brick.....	18,100										
	Agricultural products.....	600										
	Nonferrous-metals refining.....	2,900										
	Transportation.....	2,700										
	Plant and equipment.....	800										
	Aggregate, quarrying.....	700										
7	Cement.....	1,300	9,500	2,100	1,500	2,700	300	1,200	1,000	200	300	200
	Iron and steel.....	1,900										
	Petroleum products.....	1,800										
	Coal and coke.....	2,300										
	Metallic-ore mining.....	100										
	Forestry products.....	400										
	Advertising and development.....	100										
	Explosives.....	400										
	Laboratory.....	600										
	Rubber.....	200										
8	Brick.....	300	6,500	1,300	1,100	1,900						
	Agricultural products.....	4,300										
	Nonferrous-metals refining.....	100										
	Accruals from distribution 7.....	1,200										
	Total.....	415,100										

1 Calculated value of business created in subsequent distributions. Details of derivation not shown.

BREAK-DOWN NO. 13—ADVERTISING AND DEVELOPMENT

Expenditure for advertising and development by other industries		Distribution to —												
Progres- sive dis- tribution no.	Source	Amount	Total	Salaries and wages	Interest	Margin	No. 2, trans- portation	No. 3, plant and equip- ment	No. 5, in- surance and taxes	No. 8, pe- troleum products	No. 9, coal and coke	No. 10, power	No. 12, for- estry prod- ucts	
2	Retail trade.....	\$14,800	\$14,800	(37.48)	(5.85)	(7.98)	(3.46)	(26.10)	(3.91)	(1.31)	(0.62)	(5.81)	(7.48)	
	Transportation.....	23,300		\$5,500	\$900	\$1,200	\$500	\$3,800	\$600	\$200	\$100	\$900	\$1,100	
	Plant and equipment.....	10,000		59,100	9,200	12,600	5,400	41,100	6,200	2,100	1,000	9,200	11,800	
	Petroleum products.....	3,100												
	Power.....	114,800												
	Wholesale trade.....	5,900												
	Transportation.....	9,000												
	Plant and equipment.....	9,000												
	Aggregate, quarrying.....	300												
	Cement.....	100												
4	Iron and steel.....	2,300	74,500	27,900	4,400	5,900	2,600	19,400	2,900	1,000	500	4,300	5,600	
	Petroleum products.....	2,200												
	Coal and coke.....	2,300												
	Power.....	3,400												
	Metallic-ore mining.....	3,800												
	Forestry products.....	1,900												
	Laboratory.....	300												
	Rubber.....	300												
	Brick.....	300												
	Nonferrous-metals refining.....	100												
5	Manufacturing.....	44,300	38,800	14,600	2,300	3,100	1,300	10,100	1,500	500	200	2,300	2,900	
	Transportation.....	4,900												
	Plant and equipment.....	18,600												
	Aggregate, quarrying.....	300												
	Cement.....	100												
	Iron and steel.....	1,000												
	Petroleum products.....	2,800												
	Coal and coke.....	600												
	Power.....	2,100												
	Metallic-ore mining.....	5,500												
6	Forestry products.....	1,900	19,800	7,400	1,200	1,600	700	5,200	800	200	100	1,100	1,500	
	Explosives.....	200												
	Laboratory.....	200												
	Rubber.....	300												
	Brick.....	200												
	Nonferrous-metals refining.....	100												
	Transportation.....	3,400												
	Plant and equipment.....	8,500												
	Aggregate, quarrying.....	400												
	Cement.....	200												
7	Iron and steel.....	1,600	8,800	3,300	500	700	300	2,300	300	100	100	500	700	
	Petroleum products.....	1,800												
	Coal and coke.....	100												
	Power.....	1,400												
	Metallic-ore mining.....	800												
	Forestry products.....	700												
	Explosives.....	300												
	Laboratory.....	300												
	Rubber.....	600												
	Brick.....	500												
8	Nonferrous-metals refining.....	200	7,700	2,900	400	600								
	Transportation.....	1,900												
	Plant and equipment.....	2,500												
	Aggregate, quarrying.....	400												
	Cement.....	100												
	Iron and steel.....	800												
	Petroleum products.....	200												
	Coal and coke.....	100												
	Power.....	400												
	Metallic-ore mining.....	1,100												
Total.....		322,100	120,700	18,900	25,700	165,300								

[illegible]

BREAK-DOWN NO. 16—RUBBER

[illegible]

BREAK-DOWN NO. 17-BRICK

[illegible]

Calculated value of business created in subsequent distributions. Details of derivation not shown.

BREAK-DOWN NO. 21—CONTAINER

[illegible]

¹ Calculated value of business created in subsequent distributions. Details of derivation not shown.

TABLE 16.—Summary of steps in the distribution of consumer-goods expenditures, from reinvestment

Break-down no.	Expense item or industry	Progressive distribution no.—															
		1		2		3		4		5		6		7		8	
	Consumer expenditure		Per-cent		Per-cent		Per-cent		Per-cent		Per-cent		Per-cent		Per-cent		Per-cent
	Salaries and wages.....	\$1,630,000	14.28	\$3,182,500	27.88	\$5,250,300	46.00	\$6,379,200	55.89	\$6,883,300	60.30	\$7,107,100	62.26	\$7,210,500	63.17	\$7,283,800	63.90
	Interest.....	133,500	1.17	424,800	3.72	950,600	8.33	1,170,200	10.33	1,255,500	11.00	1,288,800	11.29	1,303,100	11.42	1,315,400	11.52
	Margin.....	603,800	5.29	1,644,700	14.41	2,155,500	18.88	2,531,900	22.18	2,685,800	23.53	2,749,400	24.09	2,780,000	24.35	2,805,200	24.58
2	Transportation.....	1,349,200	11.82	270,500	2.39	225,600	1.98	188,700	1.39	88,900	.76	39,000	.34	17,100	.15		
3	Plant and equipment.....	526,200	4.61	474,700	4.16	979,600	8.58	149,700	3.94	130,300	1.15	65,100	.57	30,100	.26		
4	Aggregate, quarrying.....			9,400	.08	10,900	.10	14,700	.13	12,500	.11	4,700	.04	2,400	.02		
5	Insurance and taxes.....	143,800	1.26	369,800	3.24	260,000	2.28	199,800	1.40	57,200	.50	26,300	.23	12,500	.11		
6	Cement.....			9,600	.08	6,900	.06	13,500	.12	6,300	.06	2,000	.02	1,000	.01		
7	Iron and steel.....			209,800	1.84	92,100	.81	151,200	1.32	77,500	.68	27,600	.24	13,100	.12		
8	Petroleum products.....	24,000	.21	115,600	1.01	151,500	1.33	43,200	.38	11,100	.10	6,000	.05	3,000	.03		
9	Coal and coke.....			47,100	.41	108,300	.95	25,700	.23	24,300	.21	12,200	.11	5,000	.04		
10	Power.....	119,900	1.05	130,500	1.14	80,100	.70	53,500	.47	15,100	.13	9,500	.08	4,300	.04		
11	Metallic-ore mining.....			138,100	1.21	201,600	1.77	28,900	.25	10,800	.09	23,900	.21	9,100	.08		
12	Forestry products.....			102,200	.90	102,200	.90	39,700	.35	19,800	.17	7,100	.06	3,400	.03		
13	Advertising and development.....	14,800	.13	157,700	1.38	74,500	.65	38,800	.34	19,800	.17	8,800	.08	3,900	.03		
14	Explosives.....			17,800	.16	17,800	.16	26,100	.23	10,100	.09	6,800	.06	3,500	.03		
15	Laboratory.....			20,000	.18	12,500	.11	16,300	.14	5,700	.05	3,900	.03	1,800	.02		
16	Rubber.....			27,100	.24	24,500	.21	50,400	.44	23,200	.20	6,700	.06	3,400	.03		
17	Brick.....			11,700	.10	8,400	.07	16,700	.15	7,800	.07	2,400	.02	1,200	.01		
18	Agricultural products.....			592,100	5.18	679,600	5.94	11,800	.10	24,100	.21	11,100	.10	3,200	.03		
19	Nonferrous-metals refining.....			13,500	.12	19,400	.19	21,600	.19	15,700	.14	6,500	.06	2,000	.02		
20	Container.....					2,500	.02	3,700	.03	1,500	.01	300					
21	Retail trade.....	\$11,414,400	100.00														
22	Wholesale trade.....																
23	Manufacturing.....																
24	Total.....	9,047,100	79.26	6,162,400	53.99	3,058,000	26.79	1,324,100	11.60	589,800	5.17	269,900	2.36	120,800	1.06		
	Grand total.....	11,414,400	100.00	11,414,400	100.00	11,414,400	100.00	11,414,400	100.00	11,414,400	100.00	11,414,400	100.00	11,414,400	100.00	11,414,400	100.00

Table 17 shows by industries the total value of business transacted as a result of the expenditures for consumer goods and, from that total business in each industry, the payments made to salaries and wages, to interest, and to margin, together with the total of these three items. This total for all industries is that of the original consumer-goods expenditure, the distribution of which entailed the transaction of business valued at \$32,109,300. These data are sufficient for the resumption of the analysis of the distribution of expenditures by reinvestment.

TABLE 17.—*Recapitulation of consumer-expenditures distribution from reinvestment*

Industry	Salaries and wages	Interest	Margin	Total	Value of business
Transportation.....	\$1,115,000	\$89,600	\$309,600	\$1,514,200	\$2,154,300
Plant and equipment.....	1,078,100	126,600	439,600	1,644,300	2,674,700
Aggregate, quarrying.....	23,900	1,400	3,100	28,400	57,100
Insurance and taxes.....	487,800	134,900		622,700	1,037,700

TABLE 17.—*Recapitulation of consumer-expenditures distribution from reinvestment—Continued*

Industry	Salaries and wages	Interest	Margin	Total	Value of business
Cement.....	\$10,200	\$2,500	\$3,000	\$15,700	\$40,800
Iron and steel.....	136,000	15,900	39,900	191,800	599,200
Petroleum products.....	106,600	19,600	46,700	172,900	357,600
Coal and coke.....	137,800	11,600	13,700	163,100	224,500
Power.....	89,900	65,900	116,200	272,000	415,100
Metallic-ore mining.....	162,000	14,400	50,600	227,000	451,600
Forestry products.....	146,600	8,600	28,000	183,200	276,600
Advertising and development.....	120,700	18,900	25,700	165,300	322,100
Explosives.....	13,400	3,300	8,500	25,200	65,500
Laboratory.....	24,400	3,000	7,300	34,700	66,200
Rubber.....	30,300	3,000	8,200	41,500	143,700
Brick.....	22,700	1,600	7,100	31,400	48,900
Agricultural products.....	321,000	181,300	157,500	659,800	1,325,100
Nonferrous-metals refining.....	8,700	1,200	4,000	13,900	94,300
Container.....	2,000	100	600	2,700	8,700
Retail trade.....	1,630,000	133,500	603,800	2,367,300	11,414,400
Wholesale trade.....	535,800	170,400	722,700	1,428,900	6,869,200
Manufacturing.....	1,090,900	308,100	209,400	1,608,400	3,462,100
Total.....	7,293,800	1,315,400	2,805,200	11,414,400	32,109,300

REINVESTMENT OF INTEREST AND MARGIN

In this analysis margin goes to dividends and surplus; dividends and interest combine and go to large and small incomes; surplus and large incomes combine and are used for the manufacture of producer goods; and small incomes are expended for consumer goods. Expenditures for producer goods are distributed in accordance with the percentage distribution developed in table 12, and expenditures for consumer goods are distributed according to percentages developed in

table 15. In both distributions accruals to salaries and wages are set aside. The items of interest and margin which reappear are redistributed in progressive steps. Finally, only salaries and wages remain from reinvestment. These are divided in the amounts of \$14,827,600 for producer goods and \$10,446,400 for consumer goods. The complete development of these amounts is shown in the successive distributions made in table 18.

TABLE 18.—*Reinvested interest and margin traced to ultimate payment as salaries and wages*

DIVIDENDS AND SURPLUS

[Figures in parentheses at heads of columns are percentages applied in making distributions]

Progressive distribution no.	Expenditures accruing to dividends and surplus			Distribution to—	
	Source	Amount	Total	Dividends	Surplus
1	Margin, reinvestment.....	¹ \$17,196,400	\$17,196,400	(59.82)	(40.18)
4	Margin, producer goods.....	2,383,400	5,188,600	\$10,286,600	\$6,909,800
4	Margin, consumer goods.....	2,805,200		3,103,800	2,084,800
7	Margin, producer goods.....	718,900	1,565,000	936,200	628,800
7	Margin, consumer goods.....	846,100			
10	Margin, producer goods.....	216,800	472,100	282,400	189,700
10	Margin, consumer goods.....	255,300			
13	Margin, producer goods.....	65,400	142,400	85,200	57,200
13	Margin, consumer goods.....	77,000			
16	Margin, producer goods.....	19,700	42,900	25,700	17,200
16	Margin, consumer goods.....	23,200			

LARGE AND SMALL INCOMES

Progressive distribution no.	Expenditures accruing to large and small incomes			Distribution to—	
	Source	Amount	Total	Large incomes	Small incomes
				(37.84)	(62.16)
1	Interest, reinvestment.....	¹ \$8,077,600	\$18,364,200	\$6,949,800	\$11,414,400
2	Dividends.....	10,286,600			
4	Interest, producer goods.....	1,119,500	5,538,700	2,095,800	3,442,900
4	Interest, consumer goods.....	1,315,400			
5	Dividends.....	3,103,800	1,670,700	632,200	1,038,500
7	Interest, producer goods.....	337,700			
7	Interest, consumer goods.....	396,800	503,900	190,700	313,200
8	Dividends.....	936,200			
10	Interest, producer goods.....	101,900	152,000	57,500	94,500
10	Interest, consumer goods.....	119,600			
11	Dividends.....	282,400	45,900	17,400	28,500
13	Interest, producer goods.....	30,700			
13	Interest, consumer goods.....	36,100			
14	Dividends.....	85,200			
16	Interest, producer goods.....	9,300			
16	Interest, consumer goods.....	10,900			
17	Dividends.....	25,700			

¹ From table 14.

TABLE 18.—*Reinvested interest and margin traced to ultimate payment as salaries and wages—Continued*

PRODUCER GOODS

[Figures in parentheses at head of columns are percentages applied in making distributions]

Progressive distribution no.	Expenditures accruing to producer goods by reinvestment			Distribution to—		
	Source	Amount	Total	Salaries and wages	Interest	Margin
2	Surplus.....	\$6,909,800	\$13,859,600	(74.72)	(8.08)	(17.20)
3	Large incomes.....	6,949,800		\$10,356,700	\$1,119,500	\$2,383,400
5	Surplus.....	2,084,800	4,180,600	3,124,000	337,700	718,900
6	Large incomes.....	2,095,800				
8	Surplus.....	628,800	1,261,000	942,300	101,900	216,800
9	Large incomes.....	632,200				
11	Surplus.....	189,700	380,400	284,300	30,700	65,400
12	Large incomes.....	190,700				
14	Surplus.....	57,200	114,700	85,700	9,300	19,700
15	Large incomes.....	57,500				
17	Surplus.....	17,200	46,300	34,600		
18	Large incomes.....	17,400				
	Subsequent distribution.....	11,700				
	Total, producer-goods reinvestment.....			14,827,600		

CONSUMER GOODS

Progressive distribution no.	Expenditures accruing to consumer goods by reinvestment			Distribution to—		
	Source	Amount	Total	Salaries and wages	Interest	Margin
3	Small incomes.....	\$11,414,400	\$11,414,400	(63.90)	(11.52)	(24.58)
6	do.....	3,442,900		\$7,293,800	\$1,315,400	\$2,805,200
9	do.....	1,038,500	1,038,500	2,200,000	396,800	846,100
12	do.....	313,200		663,600	119,600	255,300
15	do.....	94,500	94,500	200,100	36,100	77,000
18	do.....	28,500		60,400	10,900	23,200
	Subsequent distribution.....	16,100	44,600	28,500		
	Total, consumer-goods reinvestment.....			10,446,400		

* Sum of accruals from subsequent distributions. Details of derivation not shown.

Table 19 is a summary of the results obtained in tracing the effect of the expenditure of \$100,000,000 for highways until payments are ultimately made to salaries and wages. Direct labor on highway construction work receives \$24,391,000. Indirect labor, resulting from the investment of funds in materials and equipment for highway construction, receives a total of \$50,335,000, as shown in the third column of table 19. From reinvestment in the fields of producer and consumer goods labor receives a further share in the amount of \$25,274,000.

TABLE 19.—*Ultimate distribution to salaries and wages of \$100,000,000 highway construction expenditure*

Industry	To salaries and wages through—				
	Direct	Investment in producer goods	Reinvestment in producer goods	Reinvestment in consumer goods	Total
Highway construction.....	\$24,391,000				\$24,391,000
Transportation.....		\$13,489,600	\$3,973,700	\$1,596,900	19,060,200
Plant and equipment.....		11,169,000	3,290,100	1,544,100	16,003,200
Aggregate, quarrying.....		5,538,000	1,631,400	34,200	7,203,600
Insurance and taxes.....		4,486,500	1,321,700	698,600	6,506,800
Cement.....		3,681,000	1,084,400	14,600	4,780,000
Iron and steel.....		2,707,100	797,500	194,800	3,699,400
Petroleum products.....		1,852,200	545,600	152,700	2,550,500
Coal and coke.....		1,821,000	536,400	197,400	2,554,800
Power.....		534,900	157,600	128,800	821,300
Metallic-ore mining.....		1,030,200	303,500	232,000	1,565,700
Forestry products.....		1,067,300	314,400	210,000	1,591,700
Advertising and development.....		831,400	244,900	172,900	1,249,200

TABLE 19.—*Ultimate distribution to salaries and wages of \$100,000,000 highway construction expenditure—Continued*

Industry	To salaries and wages through—				
	Direct	Investment in producer goods	Reinvestment in producer goods	Reinvestment in consumer goods	Total
Explosives.....		\$465,600	\$137,200	\$19,200	\$622,000
Laboratory.....		567,200	167,100	34,900	769,200
Rubber.....		314,500	92,600	43,400	450,500
Brick.....		283,800	83,600	32,500	399,900
Agricultural products.....		172,600	50,800	459,700	683,100
Pipe.....		135,200	39,800		175,000
Nonferrous-metals refining.....		122,300	36,000	12,500	170,800
Container.....		65,600	19,300	2,900	87,800
Retail trade.....				2,334,500	2,334,500
Wholesale trade.....				767,400	767,400
Manufacturing.....				1,562,400	1,562,400
Total.....	\$24,391,000	50,335,000	14,827,600	10,446,400	100,000,000

The \$14,827,600 accrual to salaries and wages through reinvestment in producer goods is distributed to industries in accordance with the percentages developed for salaries and wages in table 12, and the \$10,446,400 accrual to salaries and wages through reinvestment in consumer goods is distributed to industries according to percentages developed for salaries and wages in table 15. Table 19 therefore shows the total payment to labor in each of the industries involved in highway construction.

EMPLOYMENT CREATED BY HIGHWAY EXPENDITURES

Figure 4 shows the direct employment resulting from the payment of \$24,391,000 to labor on highway work. The scale of wages and hours of work in the several industry groups must be known to establish the relative employment in indirect highway activities where labor is found to receive \$75,609,000, the balance of the original expenditure. Data on wages and hours of work were obtained from records of the Bureau of the Census (25), the Bureau of Labor Statistics (33, 35),

and from other sources. These data were adjusted to conform to recent regulatory legislation, with special reference to particular industries. The rates established for various industries and the results of the analysis based on these rates are shown in table 20. Both the direct and indirect employment is thus determined on the basis of present conditions, giving full recognition to changes which have occurred in industry.

TABLE 20.—Employment resulting from an annual highway construction expenditure of \$100,000,000

Industry	Salaries and wages	Rate per hour	Man-hours	Hours per week	Rate per week	Man-weeks	Rate per month	Man-months	Rate per year	Man-years
			Number	Number		Number		Number		Number
Direct labor.....	\$24,391,000	\$0.48	50,870,000	25.8	\$12.36	1,973,900	\$54	455,500	\$640	37,960
Indirect labor:										
Transportation.....	19,060,200	.64	29,877,000	44.1	28.14	677,300	122	156,300	1,460	13,030
Plant and equipment.....	16,003,200	.62	25,647,000	37.0	23.07	693,700	100	160,100	1,200	13,340
Aggregate, quarrying.....	7,203,600	.48	14,976,000	32.7	15.73	458,000	68	105,700	820	8,810
Insurance and taxes.....	6,506,800	.86	7,531,000	39.3	34.00	191,400	147	44,200	1,770	3,680
Cement.....	4,780,000	.57	8,430,000	33.2	18.80	254,200	81	58,700	980	4,890
Iron and steel.....	3,699,400	.61	6,093,000	33.9	20.59	179,700	89	41,400	1,070	3,450
Petroleum products.....	2,550,500	.72	3,567,000	38.1	27.26	93,600	118	21,600	1,420	1,800
Coal and coke.....	2,554,800	.60	4,265,000	30.3	18.13	140,900	79	32,500	940	2,710
Power.....	821,300	.72	1,136,000	42.5	30.73	26,700	132	6,200	1,600	510
Metallic-ore mining.....	1,565,700	.57	2,756,000	39.5	22.42	69,800	97	16,100	1,170	1,340
Forestry products.....	1,591,700	.44	3,618,000	32.5	14.28	111,500	62	25,700	740	2,140
Advertising and development.....	1,249,200	.84	1,494,000	39.4	33.00	37,900	143	8,700	1,720	730
Explosives.....	622,000	.68	917,000	34.3	23.24	26,800	101	6,200	1,210	510
Laboratory.....	769,200	.61	1,261,000	40.7	24.83	31,000	108	7,200	1,290	600
Rubber.....	450,500	.73	613,000	30.2	22.15	20,300	96	4,700	1,150	390
Brick.....	399,900	.43	921,000	31.6	13.72	29,100	59	6,700	710	560
Agricultural products.....	683,100	.12	5,509,000	72.3	8.96	76,200	39	17,600	470	1,470
Pipe.....	175,000	.61	289,000	34.4	20.88	8,400	91	1,900	1,090	160
Nonferrous-metals refining.....	170,800	.53	319,000	37.1	19.94	8,600	86	2,000	1,040	170
Container.....	87,800	.50	176,000	34.5	17.34	5,100	75	1,200	900	100
Retail trade.....	2,334,500	.51	4,595,000	39.4	20.03	116,600	87	26,900	1,040	2,240
Wholesale trade.....	767,400	.64	1,203,000	41.3	26.38	29,100	114	6,700	1,370	560
Manufacturing.....	1,562,400	.55	2,841,000	35.5	19.51	80,100	84	18,500	1,010	1,540
Total or average.....	75,609,000	.59	128,034,000	38.0	22.46	3,366,000	97	776,800	1,170	64,730
Grand total or average.....	100,000,000	.56	178,904,000	33.5	18.73	5,339,900	81	1,232,300	970	102,690
Ratio, direct labor to indirect labor.....	1:3.10	1:1.23	1:2.52	1:1.47	1:1.82	1:1.70	1:1.82	1:1.70	1:1.82	1:1.70

The data of table 20 in terms of man-hours, man-weeks, man-months, and man-years, together with wage rates and employment ratios, clearly show the employment developed. For each person employed directly on the job, 1.7 persons are employed indirectly in industries furnishing materials, equipment, and supplies, and in servicing these industries.

In the past, direct labor for highway construction has been drawn largely from rural sources and indirect labor largely from urban areas. Obviously, some of the direct workers normally reside in cities and others of the indirect class are employed in operations which require rural residence. Recently, with the requirement that 25 percent of Federal funds for highway construction be assigned to urban areas, the direct employment in cities tends to offset the indirect rural employment. In consideration of this relation, it may be stated that for each highway worker employed in rural areas, approximately 2.6 workers are employed in urban areas.

Statistics on urban and rural unemployment show that they occur in approximately the same ratio as that between urban and rural employment resulting from highway construction. Table 21 shows estimated urban and rural unemployment and ratios between them. These data are based on the 1930 census of the Department of Commerce (22), estimates

of the American Federation of Labor (4), estimates of the National Industrial Conference Board (12), and data from the Bureau of Labor Statistics on trends of employment to 1930 (33). The results establish with reasonable accuracy the number of unemployed and the ratios of rural to urban unemployment.

The data of table 21 are averages for the entire United States. Regional and seasonal variations cause considerable departure from these averages. Urban and rural employment resulting from highway work are also subject to variations with different types of highway construction, with seasons, and with regions. Highway construction, therefore, offers the possibility of adjusting employment to rural and urban needs.

TABLE 21.—Estimated unemployment in the United States, 1930-34

	Persons unemployed	Rural	Ratio of rural to urban unemployment
	Number	Percent	
1930.....	3,188,000	31.8	1:2.14
1931.....	6,800,000	28.2	1:2.54
1932.....	10,826,000	25.1	1:2.98
1933.....	14,960,000	23.5	1:3.25
1934 ¹	8,100,000	27.1	1:2.69

¹ Estimates incomplete.

VALUE OF BUSINESS RESULTING FROM \$100,000,000 HIGHWAY EXPENDITURE

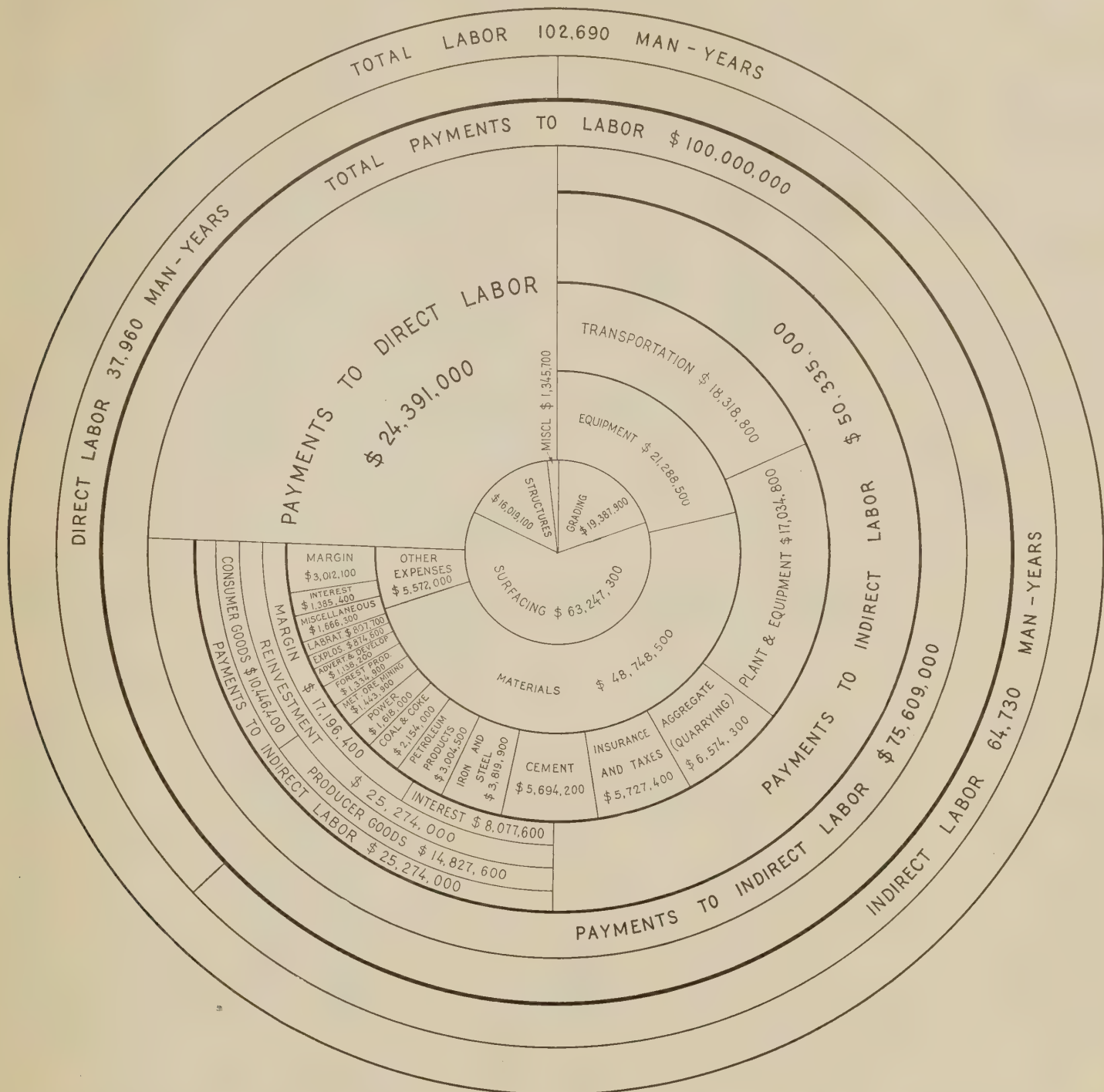


FIGURE 9.—Distribution of \$100,000,000 highway construction expenditure until ultimately paid to labor.

Figure 9 shows graphically the distribution of an expenditure of \$100,000,000 for highways and the steps through which it passes in ultimately reaching labor and causing 102,690 man-years of employment. The value of business transacted is a further measure of the effect of highway expenditures. During the progressive distribution of highway expenditure to all the major industries in the fields of producer goods and consumer goods, record was kept of the total amounts which successively passed through each of the indus-

tries in developing the labor payments shown in table 19. Table 22 shows this value of business by industries. Value of business in the field of reinvestment is assumed to be in direct proportion to the value developed in the distribution of expenditures for producer and consumer goods. These data show that \$100,000,000 spent for the construction of highways in a continuing program sets in motion forces which eventually result in the transaction of business valued at \$315,602,700.

TABLE 22.—Value of business resulting from an expenditure of \$100,000,000 for highway construction

Industry	Value of business created by—				Total
	Original expenditure	Producer-goods investment	Producer-goods reinvestment	Consumer-goods reinvestment	
Highway construction..	\$100,000,000				\$100,000,000
Transportation.....		\$26,061,800	\$7,677,200	\$3,085,500	36,824,500
Plant and equipment.....		27,707,600	8,162,100	3,830,800	39,700,500
Aggregate, quarrying.....		13,267,600	3,908,300	81,800	17,257,700
Insurance and taxes.....		9,545,700	2,812,000	1,486,200	13,843,900
Cement.....		14,759,900	4,347,900	58,400	19,166,200
Iron and steel.....		11,941,600	3,517,700	858,200	16,317,500
Petroleum products.....		6,215,000	1,830,800	512,200	8,558,000
Coal and coke.....		2,965,000	873,400	321,500	4,159,900
Power.....		2,470,900	727,900	594,500	3,793,300
Metallic-ore mining.....		2,872,000	846,000	646,700	4,364,700
Forestry products.....		2,014,200	593,300	396,200	3,003,700
Advertising and development.....		2,218,500	653,500	461,300	3,333,300
Explosives.....		2,265,200	667,300	93,800	3,026,300
Laboratory.....		1,531,900	451,300	94,800	2,078,000
Rubber.....		1,491,500	439,400	205,800	2,136,700
Brick.....		610,100	179,700	70,000	859,800
Agricultural products.....		712,200	209,800	1,897,800	2,819,800
Pipe.....		727,500	214,300		941,800
Nonferrous-metals refining.....		1,330,400	391,900	135,100	1,857,400
Container.....		310,800	91,600	12,500	414,900
Retail trade.....				16,548,000	16,548,000
Wholesale trade.....				9,838,300	9,838,300
Manufacturing.....				4,958,500	4,958,500
Total.....	100,000,000	31,019,400	38,595,400	45,987,900	315,602,700

In further amplification of the total value of business transacted, it may be stated that the \$24,391,000 payment to job labor represents the direct labor payment out of the original \$100,000,000 value of highway business. In like manner, the \$100,000,000 payment to all labor represents, in effect, the direct labor payment out of the final \$315,602,700 value of total business.

MATERIALS USED AND TYPES OF HIGHWAYS CONSTRUCTED

It is of interest to ascertain the volume and variety of the products processed by the industries engaged in this large business and, in so doing, to indicate the many industrial operations involved in highway production. Table 23 shows these data. Normal unit prices are used to determine the quantities of materials. These are given in appropriate units and are also expressed in tons in order to compute transportation in ton-miles and average haul in miles. The highway share of the average annual production is calculated on a percentage basis and on the basis of long-time production in the several industries. Determination is also made of the number of average establishments required to supply the demand created by each \$100,000,000 expended for highway construction.

TABLE 23.—Value of business and variety of products involved in the expenditure of \$100,000,000 for highway construction

MATERIALS PROCESSED IN INDUSTRIES AND USED IN HIGHWAY CONSTRUCTION

Industry	Establishments, the total annual production of which is consumed	Percentage of production in all establishments	Raw materials produced	Processed in industry					
				Establishments, the total annual production of which is consumed	Percentage of production in all establishments	Weight	Quantity	Unit price	Value of business
	Number	Percent	Tons	Number	Percent	Tons			
Transportation.....				1 railroad.....	1.10		2,104,300,000 ton-miles.....	\$0.0175	\$36,824,500
Plant and equipment.....				54 plants.....	.04	145,300			39,700,500
Aggregate-quarrying.....	630 plants.....	7.35	35,220,000			35,220,000	35,220,000 tons.....	.49	17,257,700
Insurance and taxes.....									13,843,900
Cement.....				17 plants.....	10.20	2,630,100	13,989,900 barrels.....	1.37	19,166,200
Iron and steel.....				3 plants.....	.53	362,600	362,600 tons.....	45.00	16,317,500
Petroleum products.....	1,900 oil wells.....	.59	774,000	3 refineries.....	.48	619,800	4,366,300 barrels.....	1.96	8,558,000
Coal and coke.....	29 mines.....	.49	3,014,400			3,014,400	3,014,400 tons.....	1.38	4,159,900
Power.....				11 plants.....			252,886,000 kilowatt-hours.....	.015	3,793,300
Metallic-ore mining.....	8 mines.....	4.56	1,385,600			1,385,600	1,385,600 tons.....	3.15	4,364,700
Forestry products.....	9,670 acres.....	.27	391,100	30 mills.....	.27	169,600	101,500 thousand feet, board measure.....	29.60	3,003,700
Advertising and development.....									3,333,300
Explosives.....				5 plants.....	4.80	11,700	234,600 hundredweight.....	12.90	3,026,300
Laboratory.....				3 plants.....	.003	7,600			2,078,000
Rubber.....				do.....	.68	2,800	5,619,000 pounds.....	.38	2,136,700
Brick.....	6 clay pits.....	.46	173,900	6 plants.....	.46	173,900	35,800 thousand.....	24.00	859,800
Agricultural products.....	800 farms.....	.01	42,100			42,100	42,100 tons.....	67.00	2,819,800
Pipe.....				11 plants.....	16.33	19,200	1,345,400 linear feet.....	.70	941,800
Nonferrous-metals refining.....				1 plant.....	.38	6,700	6,700 tons.....	277.00	1,857,400
Container.....				do.....	.10	4,900	9,878,500 pounds.....	.042	414,900
Retail trade.....				500 stores.....	.04	23,400	23,400 tons.....	700.00	16,348,000
Wholesale trade.....				25 establishments.....	.01	23,400	do.....	422.00	9,838,300
Manufacturing.....				15 establishments.....	.01	23,400	do.....	213.00	4,958,500
Total.....			41,001,100			43,886,500			215,602,700

Industry	Used in highway construction			
	Weight	Quantity	Unit price	Value of business
	Tons			
Transportation.....		999,700,000 ton-miles.....	\$0.0175	\$17,544,100
Plant and equipment.....	32,000	63,900,000 pounds.....	.22	14,217,100
Aggregate-quarrying.....	22,968,000	22,968,000 tons.....	.49	11,220,300
Cement.....				3,133,100
Iron and steel.....	1,961,600	10,433,700 barrels.....	1.37	14,332,600
Petroleum products.....	107,000	107,000 tons.....	45.00	4,811,700
Forestry products.....	276,800	1,930,400 barrels.....	2.38	4,592,600
Brick.....	30,200	18,060 thousand feet, board measure.....	29.60	534,600
Pipe.....	19,800	4,080 thousand.....	24.00	97,900
Direct wages.....	14,500	1,038,600 lineal feet.....	.70	727,500
Reinvestment.....				24,391,000
Total.....	25,409,900			4,397,500
				100,000,000

TABLE 23.—Value of business and variety of products involved in the expenditure of \$100,000,000 for highway construction—Continued

TYPE OF HIGHWAYS CONSTRUCTED ¹					
Type	Cost per mile	Surfaced mileage	Projects	Average project expenditure	Total cost
		Miles	Number		
Graded and drained.....	² \$4,300	456	456	\$42,500	\$19,387,900
Treated and untreated sand-clay, and untreated gravel.....	6,700	1,769	264	44,900	11,855,500
Treated gravel, macadam, low-cost bituminous mix, and bituminous macadam.....	10,600	1,138	212	56,900	12,059,600
Bituminous concrete, portland-cement concrete, and block types.....	25,300	1,606	478	85,100	40,677,900
Bridges and approaches.....	381,400	42	434	36,900	16,019,100
Total or average.....	² 22,000	4,555	1,844	54,200	100,000,000

¹ These data are representative of projects approved in the Public Works highway program that included work such as resurfacing of existing roads that served as a base, widening of road surfaces, and projects involving grading, drainage, and surfacing. The costs per mile do not reflect the average cost of constructing 2-lane surfaces on unimproved roads, but rather the cost of constructing surfaces of variable width on both improved and unimproved grades, as reported to the Bureau.

² Cost per surfaced mile.

Table 23 shows that a substantial portion of the materials processed in industry are consumed within the several industries by reason of the transfer of products from some industries as materials to other industries. The balances are materials used in highway construction, where the value of business equals the original expenditure. Table 23 also shows the several types of highways constructed during a typical program involving the general application of funds to both primary and secondary road construction. Details concerning the average allocation of amounts by types, the resulting mileages and average costs are also shown.

Thus table 23 indicates the processes involved in the complete highway industry. The indices derived on the basis of this \$100,000,000 expenditure may be applied readily to a Federal or State program of any size. The analysis is directed to setting forth, in considerable detail, the influence exerted by expenditures for highway improvement on our economic life. Such an analysis should be useful to public officials in formulating highway policy.

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⁷ References such as (19), (35), and (42) are to publications that were used to obtain basic information and background on certain industrial operations, as well as periodic changes in the trends of prices, wages, hours of work, production, and miscellaneous information such as lends itself to inferential use. The use made of these publications was such that specific reference seems unnecessary.

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